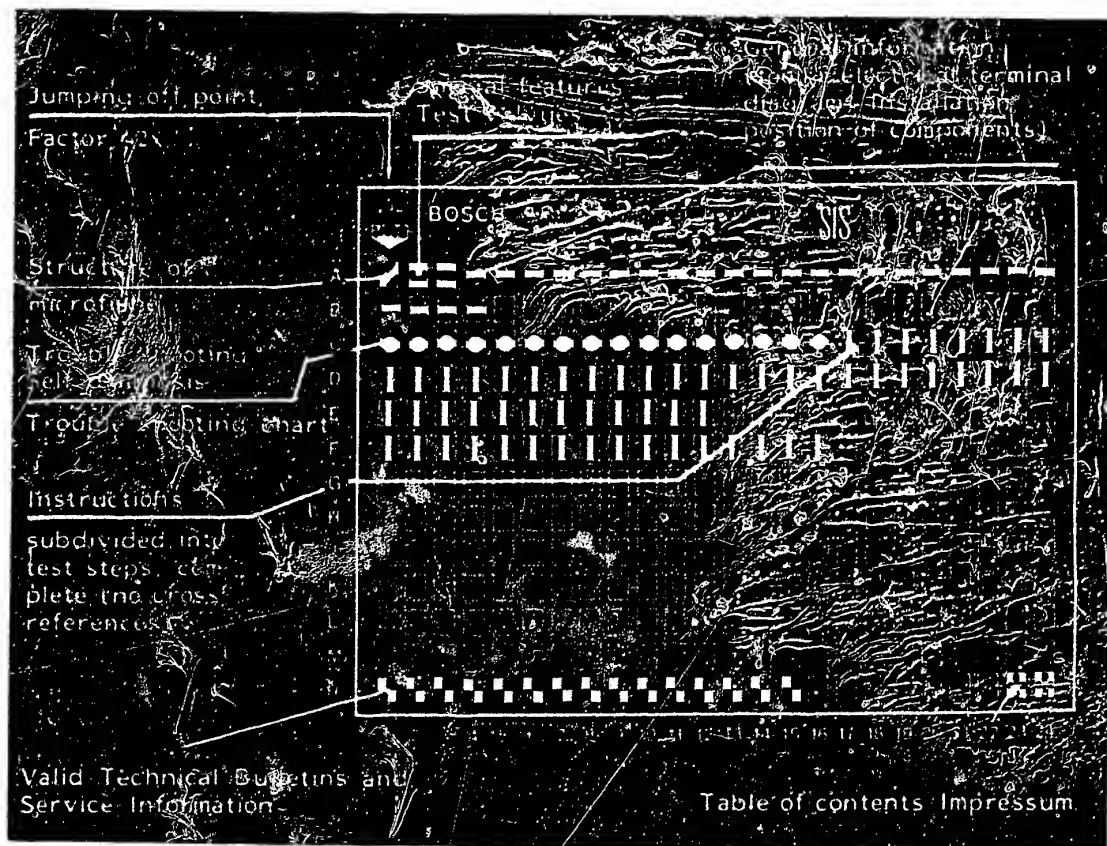


Structure of microfiche



1. Read from left to right
2. Title of microfiche (appears on each coordinate)

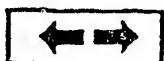
| | |
|------------|-----------------------------|
| E16 | Product/component/test step |
| | Vehicle/engine |

↑ Coordinate

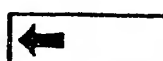
3. Limits of section



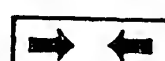
Beginning



Mid-section



End



One-page section

4. References to relevant test steps in test specifications; coordinate e.g. C6



A1

Trouble-shooting program



1. Special features

Vehicle, VOLVO 740 GL, 1984 →, Engine B 230 K, with trigger box

Ignition coil

EI-K control unit → 7.86

EI-K control unit 8.86 →

0 227 100 124

(with current limitation)

0 221 118 351

* 0 261 201 007) Engine

* 0 227 400 108) B 230 K

* not interchangeable

2. Test specifications

Ignition coil primary

0.6...1.0Ω

Ignition coil secondary

6.4...11.1kΩ

C19

Dwell angle at cranking speed 27...33%

C21

Basic ignition setting at
(automatic transmission
position P/N)

15 ± 1° BTDC

750...950 min⁻¹

D1



D8

Boiling protection switch

> approx. 103°C

< approx. 103°C

approx. ∞Ω

D9

Coolant-temperature sensor

Resistance with

coolant temperature at:

20°C 2.1...2.9kΩ

30°C 1.4...2.0kΩ

40°C 0.96...1.35kΩ

80°C 280...370Ω

90°C 210...280Ω

D13

A2

Special features/test specifications

Volvo



Test specifications (Continued)

Spark-advance angle with engine at idle
(Overboil-protection switch jumped) 21...25°
before TDC

D 15

Knock sensor "OLD" 270...330k Ω
Knock sensor "NEW" ---
Tightening torque:
Knock sensor "OLD" 11 ... 15 Nm
Knock sensor "NEW" 15 ... 25 Nm

D 17

Voltage supply,
trigger box 12 ... 14 V

E 9

Voltage supply,
ignition coil ≥ 10 V

Primary voltage with
engine at idle 295 ... 365 V

E 11

Voltage supply,
magnetic pulse generator with
ignition on ≥ 10 V

F 7

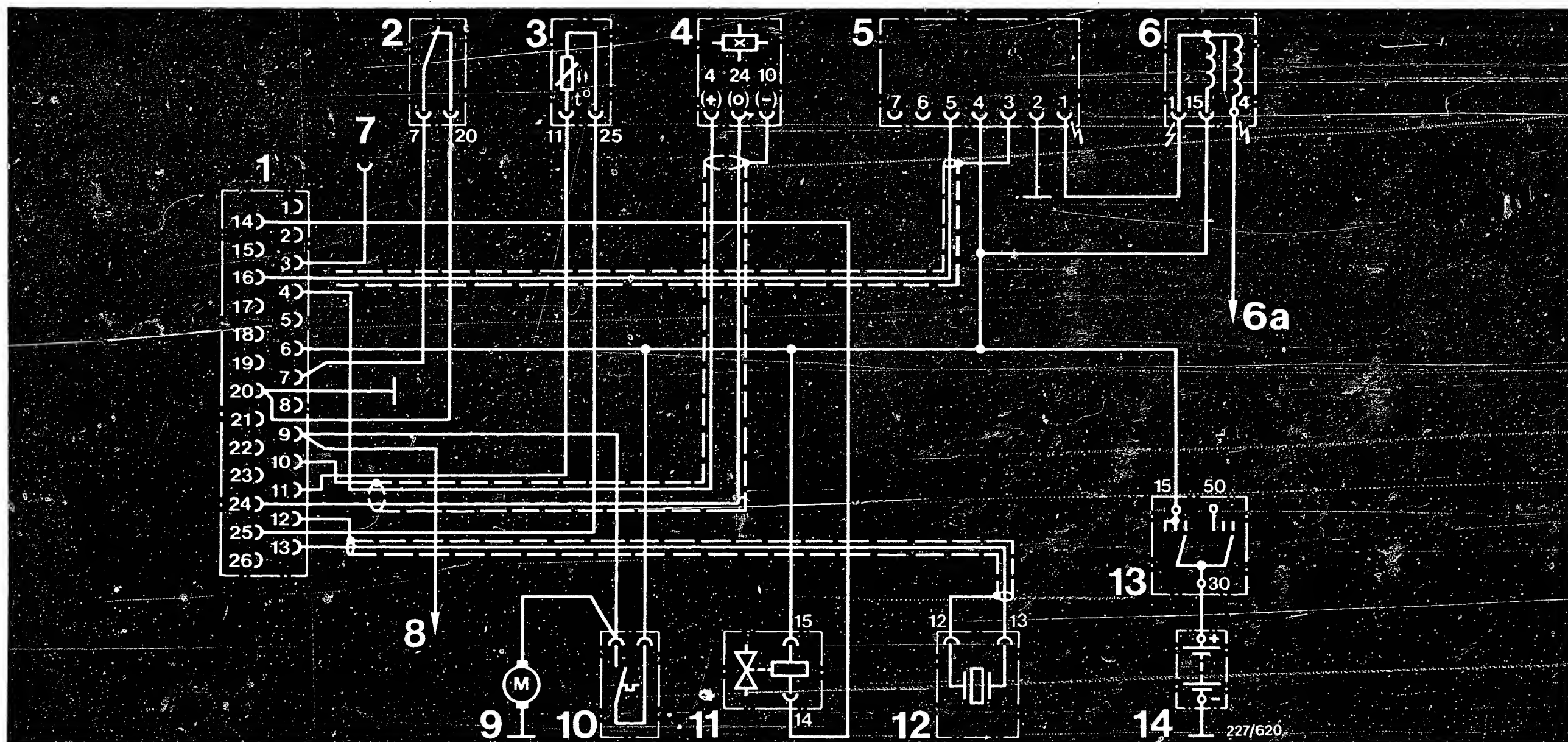
See Autodata test specifications for the settings for
idle speed, exhaust gas, valve clearance etc.

A3

Test values

Volvo





High voltage arrows: Danger, 400 V...25 kV

- 1 = EZ-K control unit
- 2 = Microswitch
- 3 = Coolant temperature sensor
- 4 = Ignition distributor
- 5 = Trigger box
- 6 = Ignition coil
- 6a = To ignition distributor
- 7 = Diagnostic connector

- 8 = To relay for starter interlock switch
or
to pressure-sensing switch of coolant compressor
- 9 = Fan motor
- 10 = Boiling-protection switch)only vehicles with air conditioner and tropics
radiator
- 11 = Solenoid valve (idle or overrun fuel cut-off)
- 12 = Knock sensor
- 13 = Ignition/starting switch
- 14 = Battery

3. Electrical terminal diagram

A4

Electrical terminal diagram

Volvo

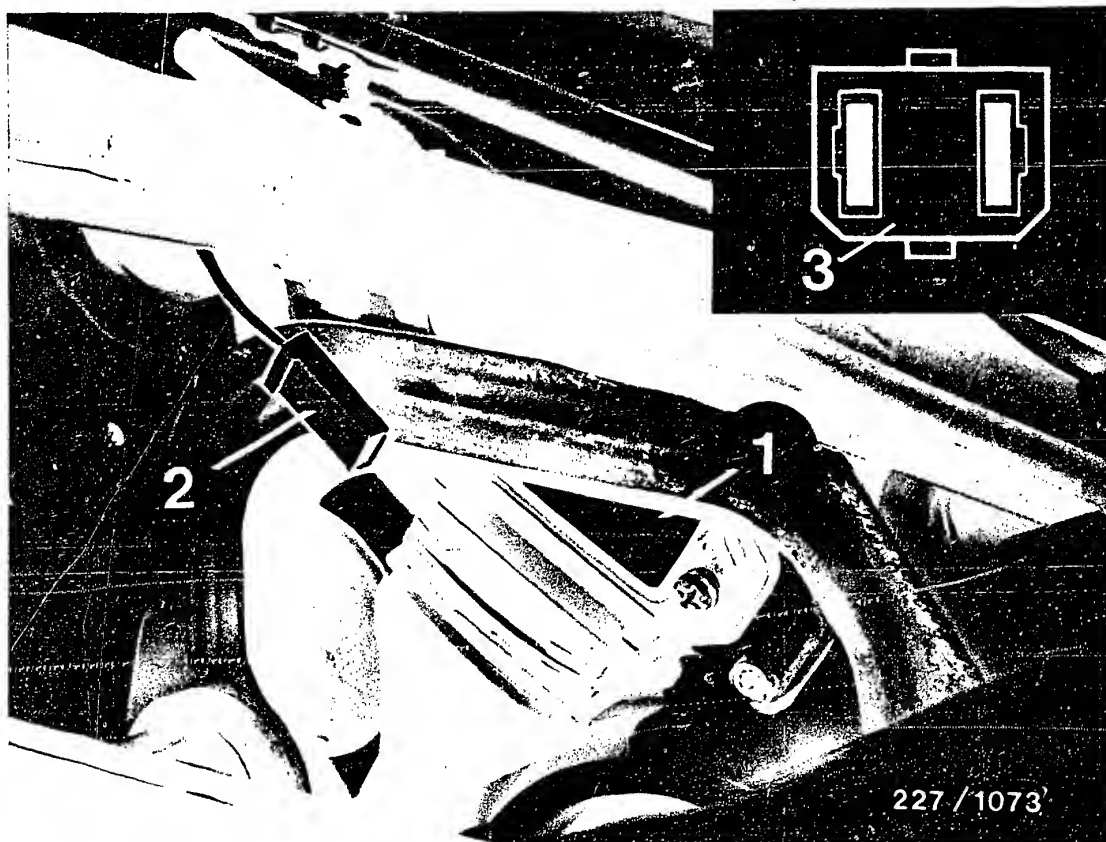


A5

Electrical terminal diagram

Volvo





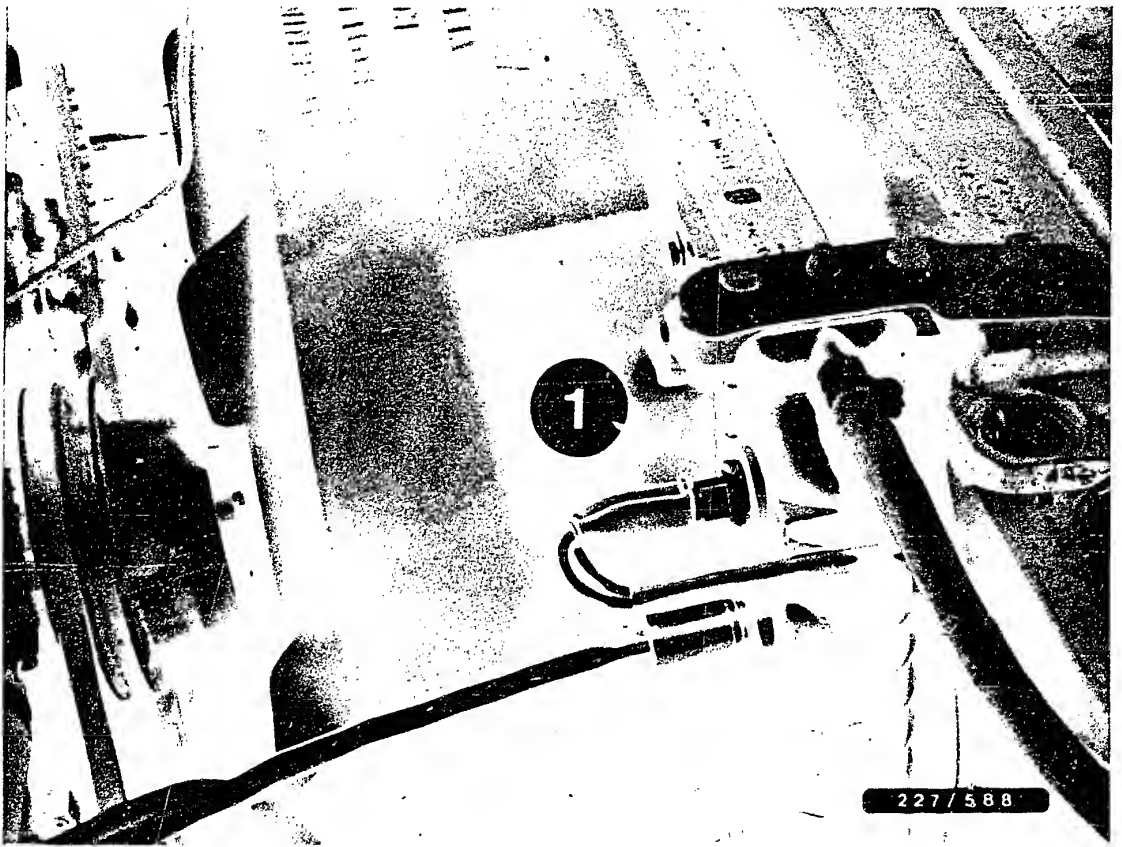
- 1 = Trigger box
- 2 = Diagnostic connection, "OLD" (1-pin)
- 3 = Diagnostic connection, "NEW" (2-pin)

4. Component locations

The control unit is mounted on a heat sink inside the engine compartment (near left-hand wheel well).

The diagnostic connector is located on the wiring harness.





1 = Boiling-protection switch

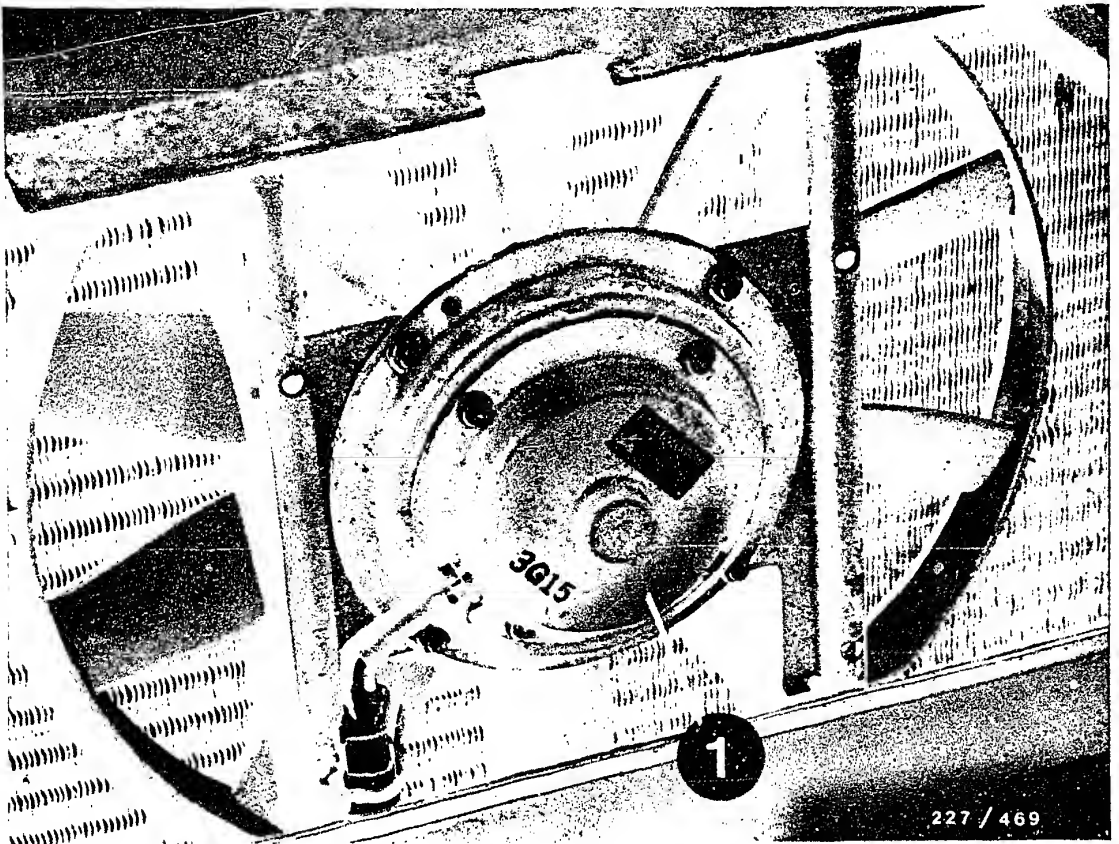
Installed only on vehicle with air conditioner and tropics radiator.

A7

Installation position of components

Volvo





227 / 469

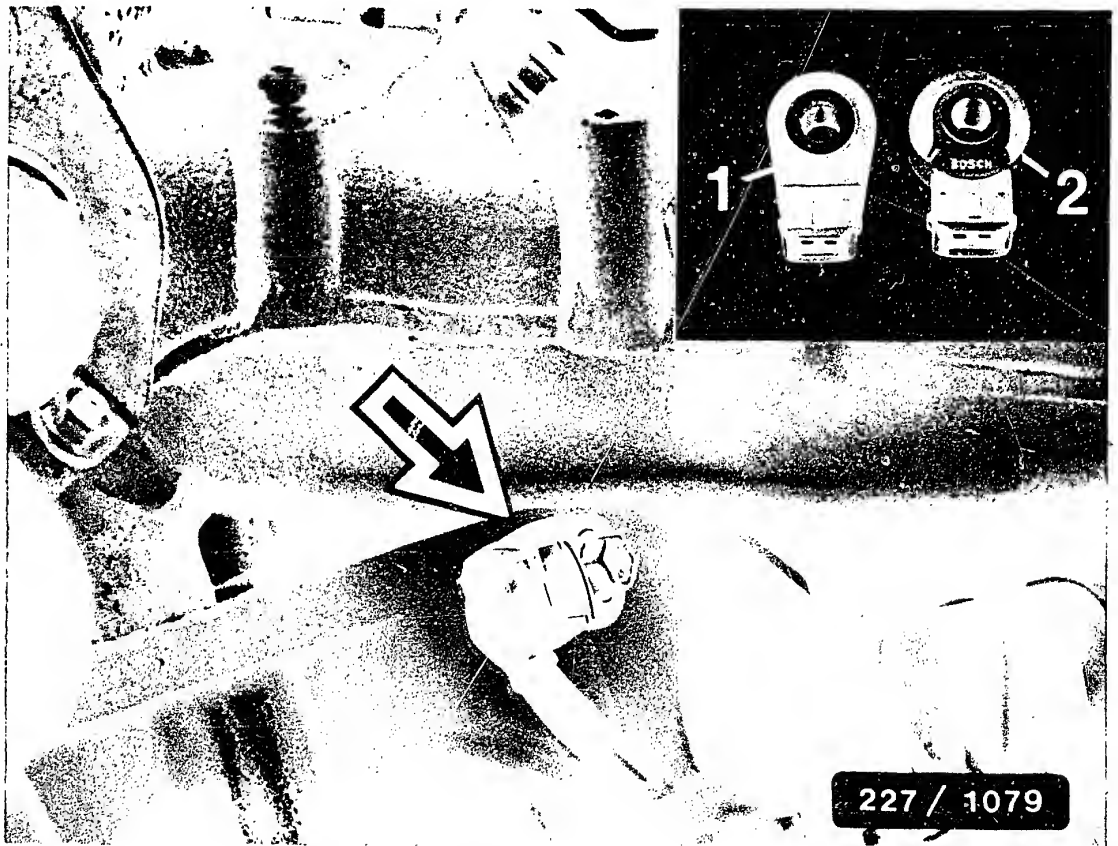
1 = Fan motor (boiling-protection device)

Installed only on vehicle with air conditioner and tropics radiator.

A8

Installation position of components
Volvo





Arrow = Knock sensor
 1 = Old version
 2 = New version

The knock sensor is located on the upper part of the engine block (driver's side).

Note:

See above for correct position of knock sensor (connection on side).

Attach mounting bolt of knock sensor w i t h o u t plain washer, spring lock washer, tooth lock washer, etc.

Tightening torque:

| | |
|-------------|--------------|
| Old version | 11 ... 15 Nm |
| New version | 15 ... 25 Nm |

Secure mounting bolt only with locking paint.



The EZ-K control unit is in the passenger compartment on the left next to the pedal block. See center illustration.

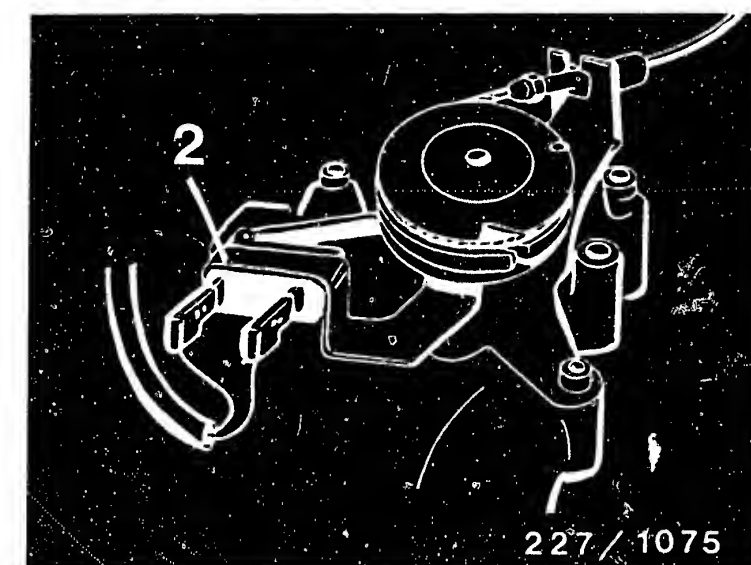
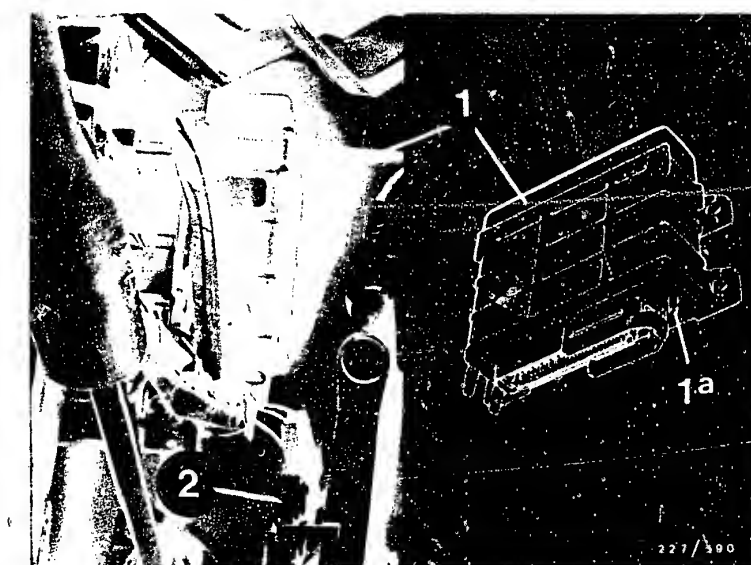
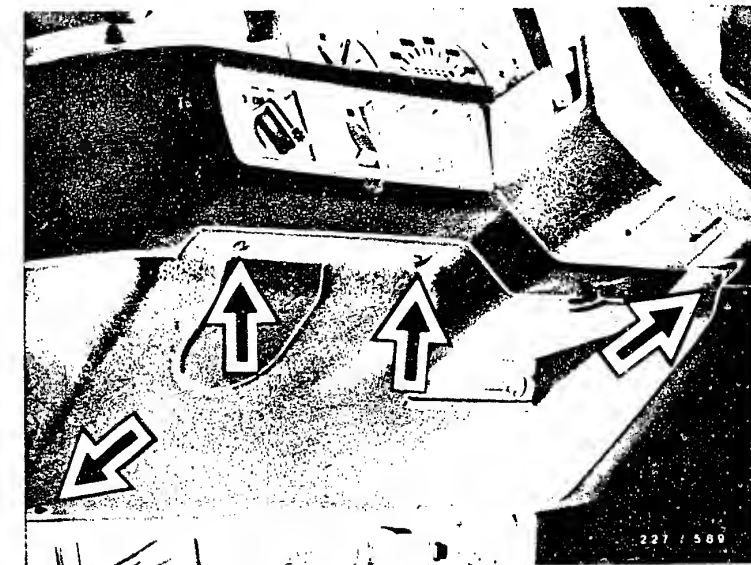
Old version of the microswitch (idle contact) is located beneath the accelerator pedal. See center illustration.

New version of the microswitch is located at the cable drum of the throttle-control mechanism. See lower illustration.

Note on removal:

Remove steering-column trim. See arrows, upper illustration.

Key to figures: 1 = EI-K control unit
1 a = Vacuum connection
2 = Microswitch



A10

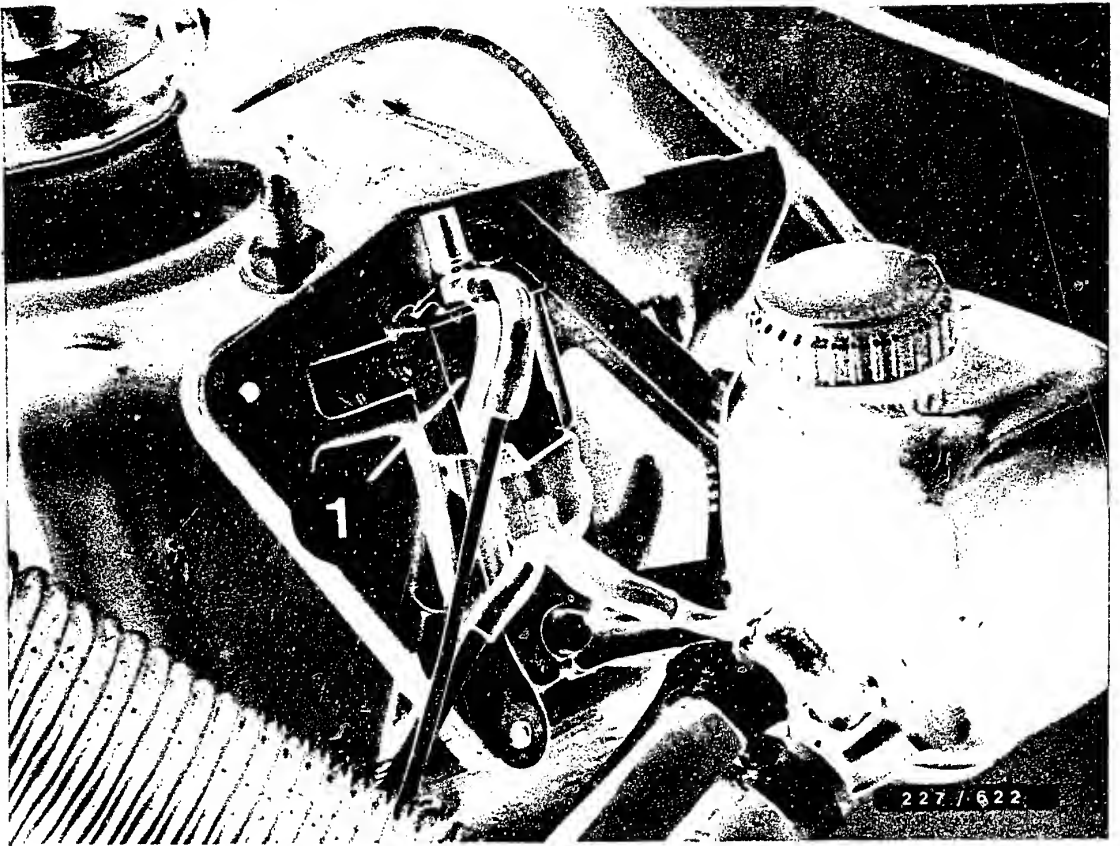
Installation position of components
Volvo



A11

Installation position of components
Volvo





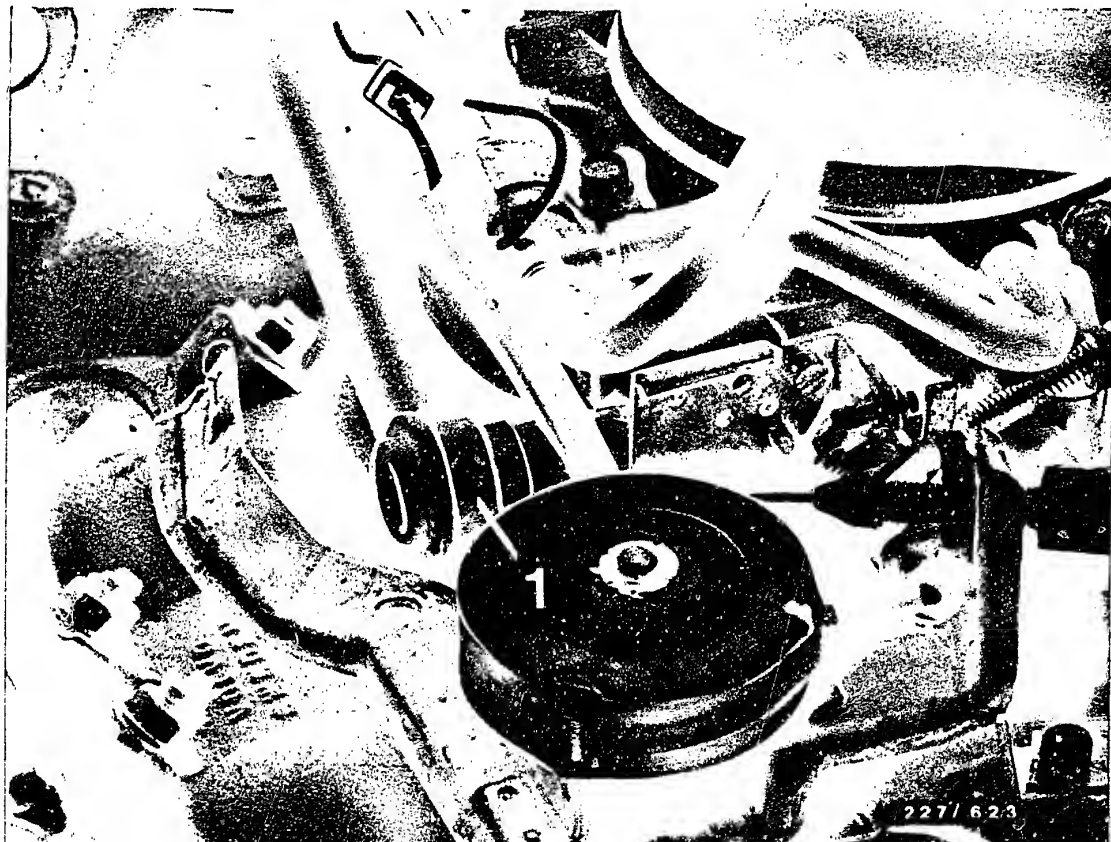
1 = Solenoid valve (idle or overrun fuel cut-off)

A12

Installation position of components

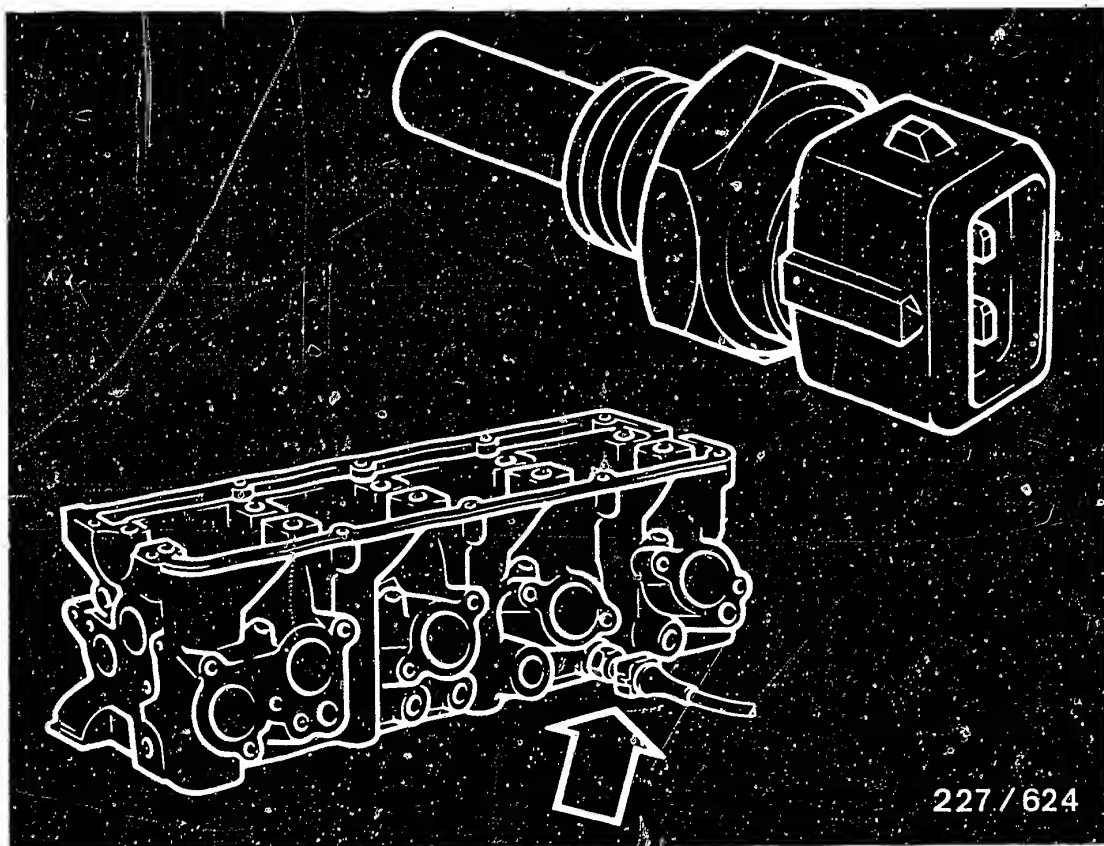
Volvo



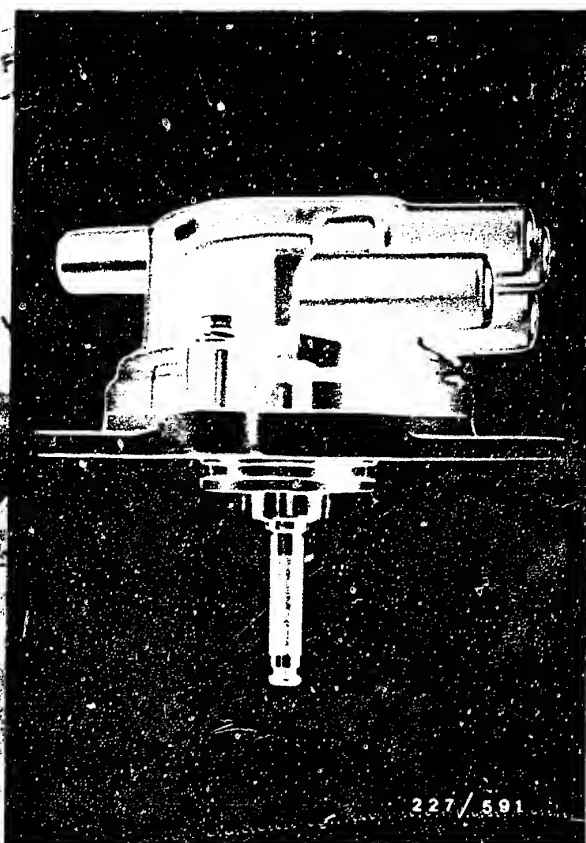
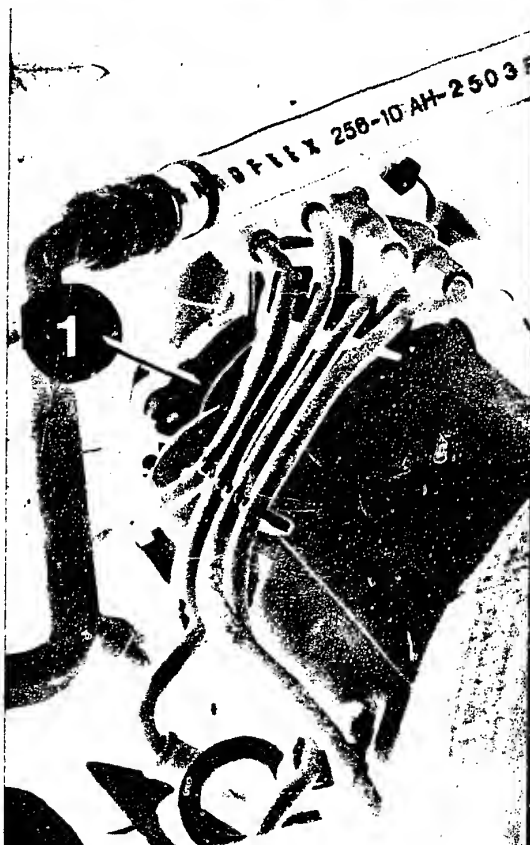


1 = Vacuum valve (idle or overrun fuel cut-off)





Coolant temperature sensor (NTC)



1 = Ignition distributor (with ignition pulse generator)

A15

Installation position of components
Volvo



5. Required test instruments and tools

| | | |
|--|--------------|---------------------------|
| Engine tester, e.g. | MOT 201 | 0 684 000 201 |
| Pulse shaper (required for measuring the primary voltage with MOT 201, 202, 206 and 400) | | 1 684 463 154 |
| Spark discharge tester, e.g. Ignition coil condenser tester | EFAW 106 A | 0 681 100 001 |
| or Single spark discharge tester | EF 1177 / 7 | 1 684 531 000 |
| 5 k Ω sleeve-type suppressor | | 0 356 500 001 |
| Ohmmeter | ETE 014.00 | 0 684 101 400 |
| or | Pontavi WH 2 | commercially available |
| Voltmeter, e.g. | ETE 014.00 | 0 684 101 400 |
| Evaluation unit (evaluation of self-diagnosis) | | KDAW 9980 |
| Test leads (for proper attachment of test equipment to connectors) | | KDZS 0004 |
| Test prods (for proper attachment of test equipment to connectors) | | commercially available |
| Heat-conducting paste | | 5 942 860 003 |
| Screw-locking varnish 30g | | 5 703 245 003 |
| Torque wrench Range 5...60 Nm | | Comm. available |
| Self-made auxiliary lead (e.g. for testing of boiling-protection function) | | |
| Components required approx. 90mm of cable 1.5mm ² | | 6 210.. |
| 2 blade terminals | | 8 784 480 011 |



6. Incorrect indication of speed, dwell angle and firing point

Incorrect indication of speed, dwell angle and firing point by test equipment may occur in ignition systems with control unit 0 227 100 124 (TZ-I) incorporating current limitation.

See coordinates N 10 - N 14 for additional information.

7. Hazards in electronic ignition systems

Increased demands placed on ignition systems by modern engines, as well as the desire for reduced maintenance, caused electronic ignition systems to be introduced as standard equipment some time ago.

As a rule, the power supplied by nearly all electronic ignition systems exceeds that of conventional systems, and further increases are expected. Thus electronic ignition systems are within a power range where contact with live parts or terminals can be extremely hazardous (on both the primary and secondary sides).

We therefore recommend that any work or tests performed on the ignition system be in accordance with VDE Regulations (Association of German Electrical Engineers), particularly VDE 0104 dated July, 1967, as well as all pertinent national regulations.



The ignition must always be switched off when work is performed on the ignition system (switch off ignition and/or power supply).

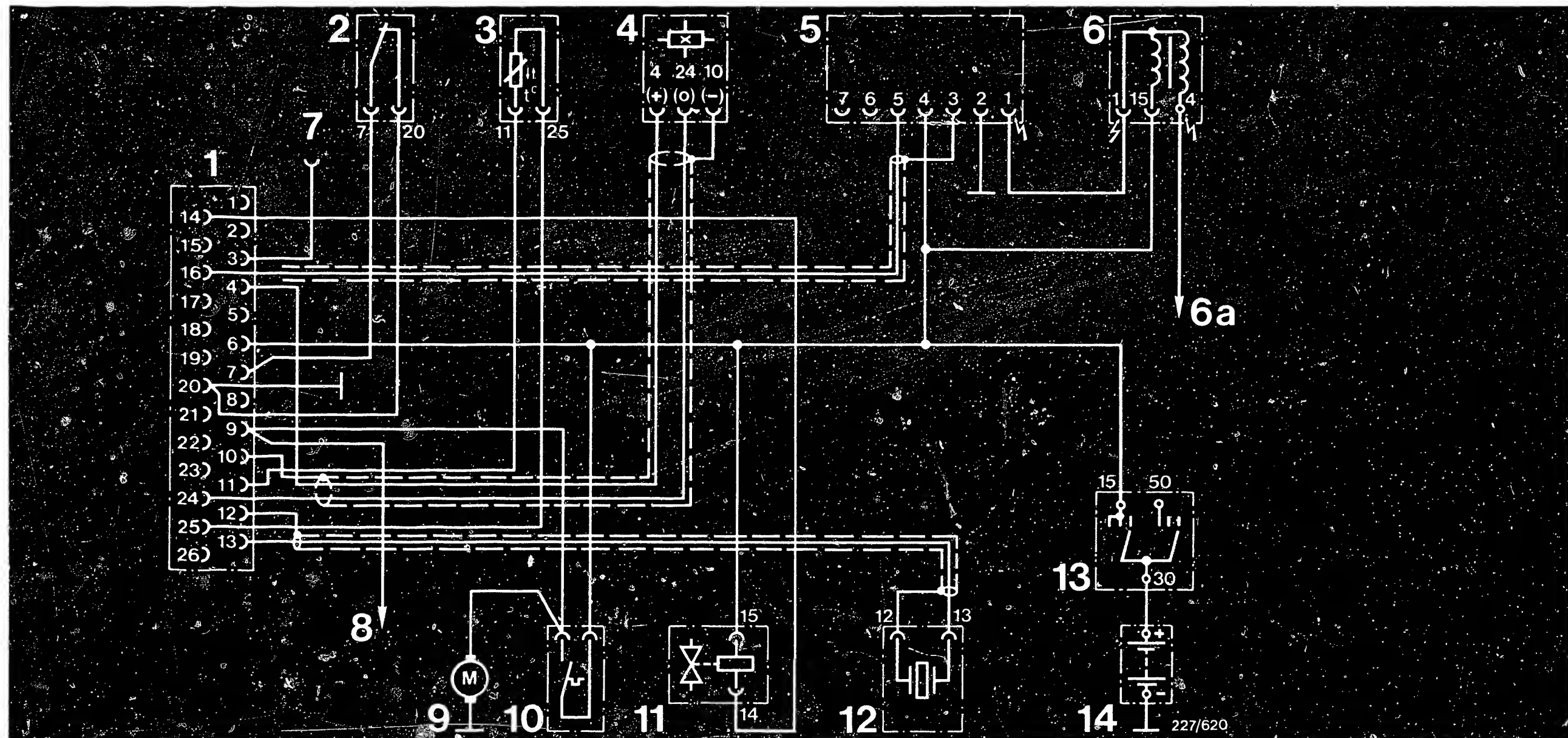
This work includes:

- attaching engine testers (timing light, dwell-tach tester, ignition oscilloscope, etc.)
- replacing ignition system parts (spark plug, ignition coil, ignition distributor, ignition cable, etc.)

If, when checking the ignition system or when performing adjustments of the engine (e.g. mixture preparation), it becomes necessary to switch on the ignition (ignition/voltage source), the above-mentioned dangerous voltages occur over the entire system.

Hazards therefore exist not only within the individual subassemblies of the ignition system (e.g. ignition distributor, ignition coil, control unit, ignition harness), but also at the wiring harness (e.g. tachometer connector, diagnostic connector), plug connection cables and test equipment.





High voltage arrows: Danger, 400 V...25 kV

- 1 = EZ-K control unit
- 2 = Microswitch
- 3 = Coolant temperature sensor
- 4 = Ignition distributor
- 5 = Trigger box
- 6 = Ignition coil
- 6a = To ignition distributor
- 7 = Diagnostic connector

- 8 = To relay for starter interlock switch
or
to pressure-sensing switch of coolant compressor
- 9 = Fan motor (only vehicles with air conditioner and tropics)
- 10 = Boiling-protection switch radiator
- 11 = Solenoid valve (idle or overrun fuel cut-off)
- 12 = Knock sensor
- 13 = Ignition/starting switch
- 14 = Battery

Using the wiring diagram of an electronic ignition system as an example, hazardous points are marked with high-voltage arrows.

A19

Danger of accident
Volvo



A20

Danger of accident
Volvo



8. Important vehicle information

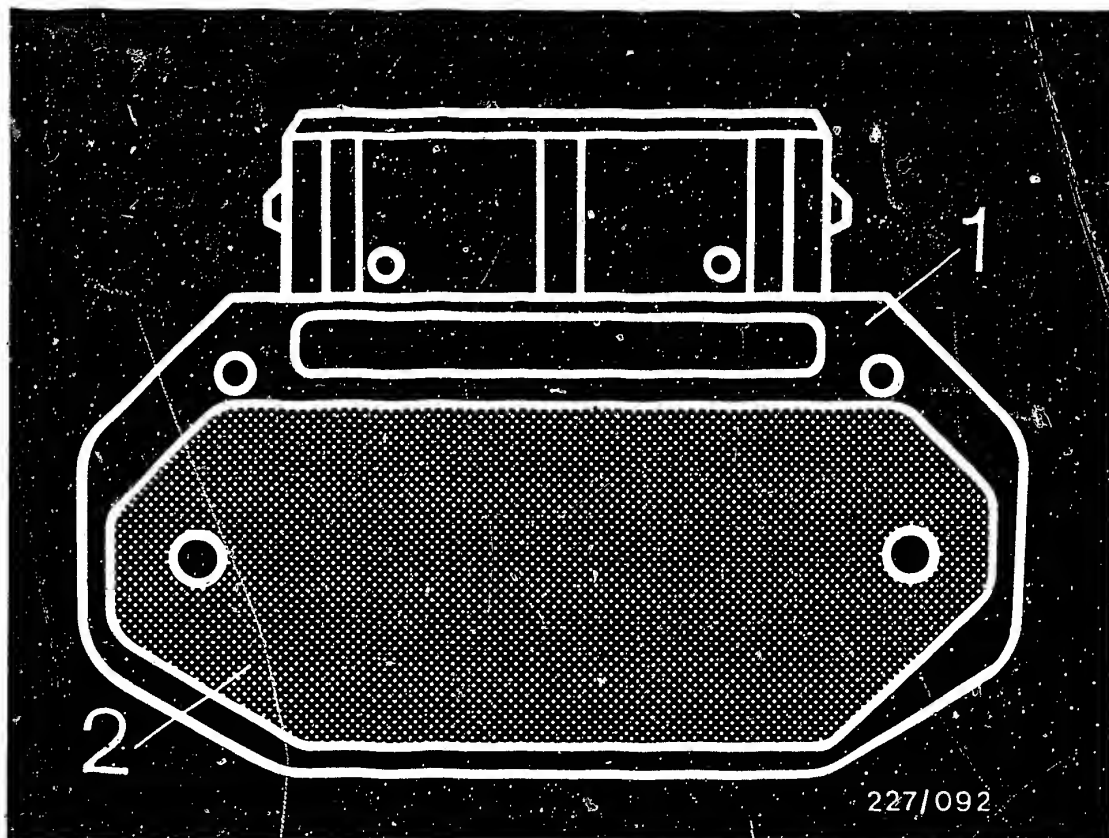
- Conduct resistance measurements only with ignition switched off or battery disconnected (tester defective)
- During compression testing remove control unit plug, or using an auxiliary cable securely connect ignition coil terminal 4 to ground (dangerously high voltage, insulation damage on ignition coil, ignition distributor, ignition harness).

Note:

Auxiliary cable must have at least 2 k Ω suppression, e.g. 5 k Ω sleeve-type suppressor 0 356 500 001.

- Do not replace specified ignition coil (see part No.) with a different type of ignition coil.
- Do not connect a suppression capacitor to ignition coil terminal 1.
- Do not connect ignition coil terminal 1 to ground as an anti-theft measure (when ignition is switched "on" ignition coil will be destroyed).
- Do not connect a positive battery terminal or test lamp to ignition coil terminal 1 (control unit will be destroyed).
- Do not remove the high voltage ignition cable between ignition coil terminal 4 and ignition distributor terminal 4 with the engine running.
- Flashover from ignition coil terminal 4 to ignition coil terminals 1 and 15 must be prevented. The magnetic pulse generator and control unit could be destroyed.





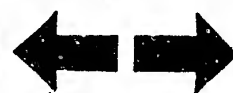
1 = Control unit

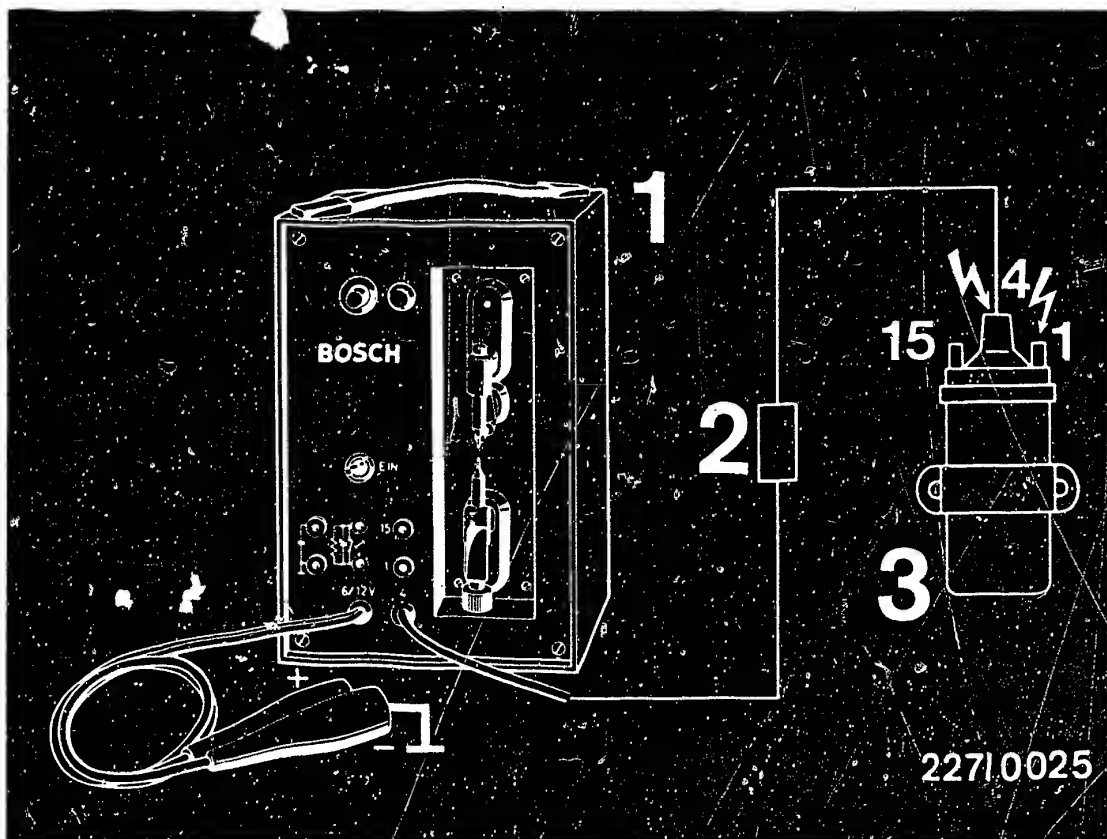
2 = Baseplate

- Coat baseplate with thermal conduction paste before mounting control unit.

Use only suitable object (screwdriver, match, etc.) to apply paste.

Keep thermal conduction paste off painted parts.





1 = Spark discharge tester
2 = 5 kΩ sleeve-type suppressor

3 = Ignition coil

Danger arrows: 400 V ... 25 kV

- To prevent damage to the control unit when using a spark discharge tester, a suppression resistor of at least 2 kΩ must be connected between the spark discharge tester and ignition coil terminal 4 (e.g. 5 kΩ sleeve-type suppressor 0 356 500 001) to prevent damage to the control unit.

- To prevent damage to the control unit, a suppression resistance of at least 2 k Ω must be connected to the secondary side of the ignition system. The original distributor rotor must be installed with a 1 k Ω suppression resistor (also do not use a 5 k Ω distributor rotor for radio interference suppression).
- Do not attach any external voltage source such as an ohmmeter to the magnetic pulse generator (hall generator).
Use caution when switching meter ranges.
- Leads from ignition pulse generator to EZ-K control unit and from EZ-K control unit to trigger box must be shielded (malfunction of EZ-K control unit/trigger box).
- Flashover or punchthrough at ignition distributor cap (poor insulation) may destroy the magnetic pulse generator and the control unit.
- Do not disconnect battery terminals with engine running.
- Do not assist starting at more than 16 volts or with a fast charger.
- In the case of incorrect battery polarity, ignition pulse generator, trigger box and ignition coil as well as EZ-K control unit will be destroyed.
- Knock sensor cable must be shielded and routed separate from high voltage cables.
- Attach mounting bolt of knock sensor w i t h o u t plain washer, spring lock washer, tooth lock washer, etc. Secure mounting bolt only with locking paint.



Idle-speed compensation

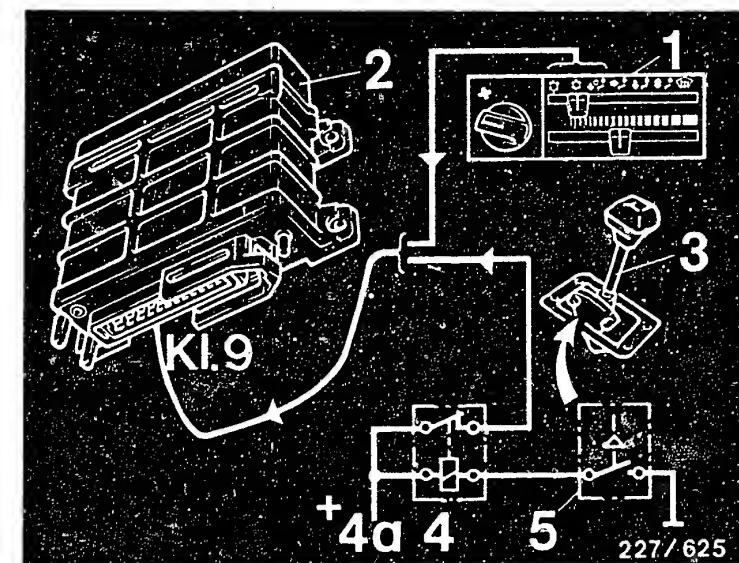
Vehicle with air conditioning (AC)

With vehicles with manually-shifted transmissions, the ignition is advanced by 8° when cooling is selected (AC control unit). This advance takes place only at engine temperatures > 60° C.

Vehicles with automatic transmission

The EZ-K control unit is fed with a signal from the selector lever via a cut-off relay.

When a gear is selected, the ground connection of the relay is interrupted and the relay drops out, thus connecting term. 9 of the EZ-K control unit to battery voltage. The EZ-K control unit advances the ignition by 8°. This advance occurs only at engine temperatures > 60° C.



- 1 = AC control unit
- 2 = EZ-K control unit
- 3 = Selector lever
- 4 = Cut-off relay
- 4a = To ignition starting switch
- 5 = Starter interlock switch

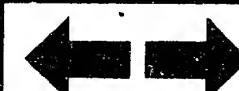
B1

Important vehicle information
Volvo



B2

Important vehicle information
Volvo



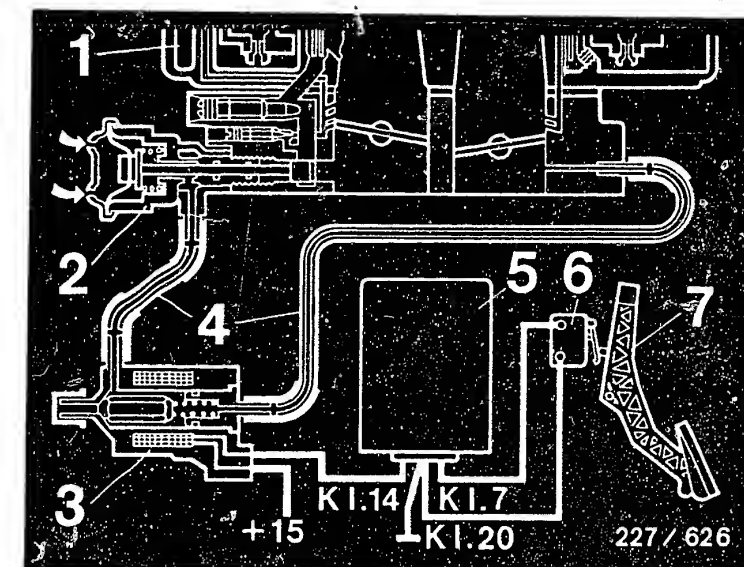
Idle or overrun fuel cut-off

In order to reduce fuel consumption, the carburetor incorporates a system which interrupts the fuel supply during engine overrun (by blocking the idling feed orifice), provided that the engine temperature is more than 85° C. This system also prevents the engine from "running on" when it is switched off.

The system comprises a vacuum valve on the carburetor, a solenoid-operated valve, a microswitch on the accelerator pedal (new version, on the throttle-control mechanism), and the EI-K control unit.

When the accelerator pedal is released, the microswitch signals this change in status to the EZ-K control unit. If, at this time, the engine speed is $> 1610 \text{ min}^{-1}$, the EZ-K control unit interrupts the ground connection of the solenoid valve. The solenoid valve opens, thus connecting the vacuum valve to the vacuum present behind the throttle valve. The vacuum valve closes, thus interrupting the fuel supply until the engine speed falls to $< 1550 \text{ min}^{-1}$.

When the engine is switched off, the solenoid valve is switched to no-volt conditions and the vacuum valve blocks the flow of fuel through the idle system.



K1. = Terminal

1 = Carburetor

2 = Vacuum valve

3 = Solenoid valve

4 = Vacuum hose

5 = EZ-K control unit

6 = Microswitch

7 = Accelerator pedal

B3

Important vehicle information
Volvo



B4

Important vehicle information
Volvo



9. Troubleshooting

9.1 Using the self-diagnosis system and the self-diagnosis test chart

This vehicle is equipped with an EZ-K control unit which has a self-diagnosis feature (knock control only).

Therefore every test conducted with the engine running must begin with the self-diagnosis system.

Coordinates C5/C6 describe how to activate the system.

The self-diagnosis test chart which begins at coordinates C7/C8 identifies trouble indicators (consisting of flashing code), causes of trouble and test procedures, and gives the coordinates for more specific troubleshooting.

If the self-diagnosis system indicates no trouble but the cause of the customer's complaint has not been eliminated, continue the troubleshooting procedure in accordance with the troubleshooting chart and the troubleshooting sequence beginning at coordinate C9.

9.2 Using the troubleshooting chart

The troubleshooting chart beginning at coordinate C9 lists customer complaints (symptoms), causes of trouble, test procedures and reference coordinates.

Select the possible cause of the trouble which corresponds to the customer's complaint as indicated in the troubleshooting chart.

If the cause of the trouble is unclear, begin testing using the extensive, self-contained troubleshooting sequence beginning at coordinate C17.

If the cause of the trouble can be clearly determined according to the troubleshooting chart, the problem can be pinpointed using the given coordinates without having to go through the entire troubleshooting sequence for each problem.

If no coordinates are given, proceed with troubleshooting using the "test steps" column.

C1

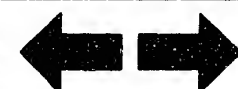
Trouble-shooting / Self-diagnosis

Volvo

**C2**

Trouble-shooting / Self-diagnosis

Volvo



9.3 Using the trouble-shooting program

The troubleshooting program beginning at coordinate C 17 is divided into 3 columns:

The left-hand column gives test steps and test values.

The center column gives instructions for repair.

The right-hand column contains the corresponding figures and wiring diagrams and indicates their locations.

If the questions given in the left-hand column can be answered "yes", go on to the next test directly below.

If a question is answered "no", move over to the center column and conduct the tests listed there.

9.4 Testing requirements

Battery fully charged, fuel system OK, engine in good working order (compression, valve clearance, etc.), ambient temperature or temperature of ignition system between 0 and 100°C (temperature has pronounced effect on measurements).

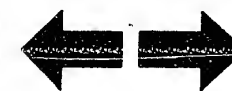
C3

Trouble-shooting / Self-diagnosis
Volvo



C4

Trouble-shooting / Self-diagnosis
Volvo



9.5 Activation of self-diagnosis

Test prerequisite: Engine running at in excess of 1000 min⁻¹

General

The EI-K control unit features self-diagnosis with diagnosis connection in the engine compartment (see picture).

Only 1 fault is ever indicated with this self-diagnosis.

The first fault detected must be eliminated before further faults can be interrogated.

A total of 2 different faults (knock control only) can be recognized by way of the diagnosis connection in the form of a flashing code.

The flashing pulses are recorded with the evaluation unit KDAW 9980 and assessed (counted) by the person performing the test.

Activation

Connect socket 1 of evaluation unit to battery term. 30 (+).

Connect socket 2 of evaluation unit to diagnosis connection (see picture).

Switch on ignition.

Lamp of evaluation unit must light up. If lamp does not light up, then perform test step on Coordinate C23/C24.

Then continue activation in accordance with Coordinate C5/C6.

Start engine; run it at in excess of 1000 min⁻¹ and then at idle.

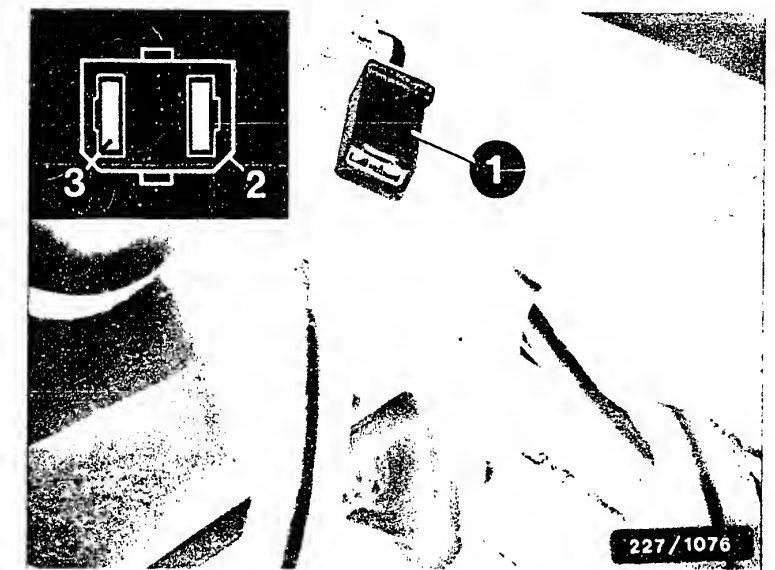
Lamp of evaluation unit flashes depending on fault.

The flashing code can be evaluated and the fault eliminated using the self-diagnosis test table (Coordinate C7/C8).

Note: There is a pause after every diagnosis run (lamp OFF).

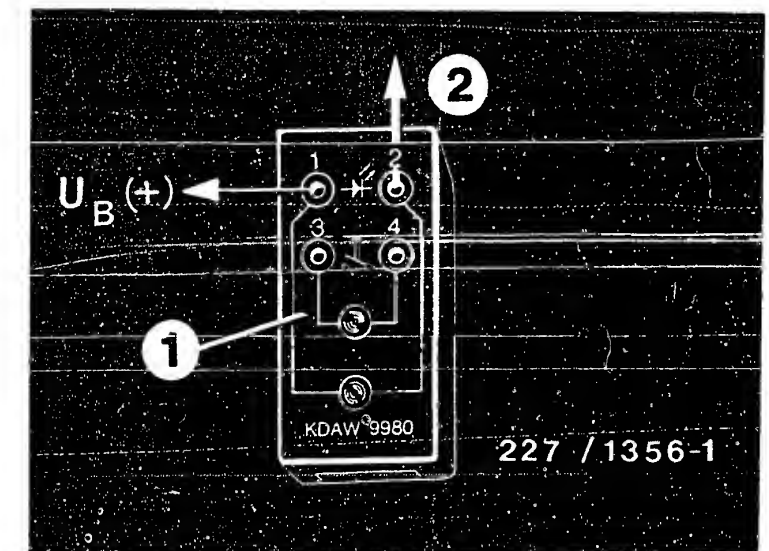
Diagnosis runs including pauses are repeated until ignition is switched off. This likewise clears the fault stored in the EI-K control unit.

Self-diagnosis activation with subsequent fault elimination must be repeated until no further flashing code is indicated (knock control is then O.K.).



- 1 = Diagnosis connection "old"
- 2 = Diagnosis connection "new"
- 3 = Diagnosis terminal post

- 1 = Evaluation unit KDAW 9980
- 2 = to diagnosis connection



C5

Trouble-shooting / Self-diagnosis
Volvo



C6

Trouble-shooting / Self-diagnosis
Volvo



Self-diagnosis checking table

| Fault indication Flashing code | Cause of fault | Test instructions . | Coordinates |
|-----------------------------------|-----------------------------|--|-------------|
| No flashing code | Knock control O.K. | ----- | ----- |
| 1 not used | ----- | ----- | ----- |
| 2 not used | ----- | ----- | ----- |
| 3 not used | ----- | ----- | ----- |
| 4 | Knock control defective | Check knock sensor (mounting of knock sensor, open circuit/short circuit), or EZ-K control unit defective. | D 17 |
| 5 | EZ-K control unit defective | Replace EZ-K control unit | ----- |

C7

Trouble-shooting /Self-diagnosis
Volvo



C8

Trouble-shooting / Self-diagnosis
Volvo



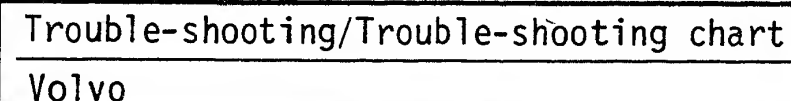
Customer complaint (symptom)

Customer complaint (symptom)

- Cause of trouble

Coordinates

Trouble-shooting/Trouble-shooting chart



Customer complaint (symptom)

1. Starting motor operates, but engine fails to start
2. Rough idling
3. Engine refuses to idle, or runs on
4. Poor throttle response
5. Engine lacks power
6. Misfiring
7. Fuel consumption too high
8. Engine pings/knocks
9. Backfiring
10. Engine becomes too hot

| | | | | | | | | | | <u>Cause of trouble</u> | <u>Test instructions</u> | <u>Coordinates</u> |
|---|---|--|---|---|---|---|---|---|---|--|--|--------------------|
| ● | ● | | | | | | | ● | | Firing sequence incorrect | Firing sequence 1 - 3 - 4 - 2 | --- |
| ● | | | | | | | | | | Contact resistance, trigger box or EZ-K control unit defective | --- | C 21 |
| | | | ● | ● | | ● | | | | Microswitch idle contact defective | --- | D 1 |
| ● | ● | | ● | ● | ● | ● | ● | ● | | Basic ignition setting incorrect | In order to avoid an incorrect setting, be sure to carry out testing in accordance with the coordinate specifications. | D1...D8 |
| | | | | | | | | | ● | Control lead or boiling-protection switch defective | --- | D 9 |
| | | | | | | | | | ● | Coolant temperature sensor defective | --- | D 13 |
| | | | | | | | | | ● | Boiling-protection function defective | In order to avoid an incorrect measurement, be sure to carry out testing in accordance with the coordinate specifications. | D13...D16 |



Trouble-shooting chart

Customer complaint (symptom)

1. Starting motor operates, but engine fails to start
2. Rough idling
3. Engine refuses to idle, or runs on
4. Poor throttle response
5. Engine lacks power
6. Misfiring
7. Fuel consumption too high
8. Engine pings/knocks
9. Backfiring
10. Engine becomes too hot

| | | | | | | | | | | | |
|---|--|---|---|---|--|---|---|--|--|--------------------------|--------------------|
| | | | | | | | | | <u>Cause of trouble</u> | <u>Test instructions</u> | <u>Coordinates</u> |
| | | | | ● | | ● | | | Knock sensor or EZ-K control unit defective | --- | D 17 |
| | | | ● | ● | | ● | ● | | Vacuum sensor of EZ-K control unit defective | --- | D 23 |
| | | ● | ● | | | | | | Idle fuel cut-off defective | --- | E 1 |
| | | | | | | ● | | | Overrun fuel cut-off defective | --- | E 3 |
| ● | | | | | | | | | Supply voltage for trigger box defective | --- | F 1 |
| ● | | | | | | | | | Supply voltage for EZ-K control unit defective | --- | F 3 |

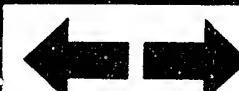
C13

Trouble-shooting/Trouble-shooting chart
Volvo



C14

Trouble-shooting/Trouble-shooting chart
Volvo



Customer complaint (symptom)

2. Rough idling

3. Engine refuses to dila, or runs on

4. Poor throttle response

5. Engine lacks power

6. Misfiring

7. Fuel consumption too high

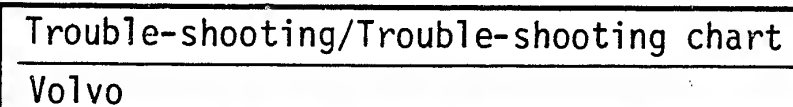
8. Engine pings/knocks

9. Backfiring

10. Engine becomes too hot

Cause of trouble

| | | | | | | | | | | <u>Cause of trouble</u> | <u>Test instructions</u> | <u>Coordinates</u> |
|---|--|--|---|--|---|---|--|--|--|------------------------------------|---|--------------------|
| ● | | | | | | | | | | Magnetic pulse generator defective | --- | F 5...F10 |
| ● | | | | | | | | | | EZ-K control unit defective | --- | F 11 |
| | | | ● | | ● | | | | | Abnormal engine noise | *Mechanical defect on engine (damaged bearings, broken valve springs etc) | --- |
| | | | ● | | ● | ● | | | | Incorrect fuel | Octane number of fuel too low | --- |



9.7 Trouble-shooting program

Check primary signal.

If oscilloscope or tachometer tester not available, check for ignition spark on spark discharge tester.

Primary signal with oscilloscope

Connect oscilloscope to ignition coil as per operating instructions. Start engine. Oscilloscope must indicate primary voltage (magnitude not important).

Primary signal with tachometer tester

Connect tachometer tester to ignition coil as per operating instructions. Start engine. Tachometer tester must register a value (magnitude not important).

Ignition spark with spark discharge tester

Remove high tension ignition cable at terminal 4 of ignition coil.
Connect spark discharge tester with sleeve-type suppressor (5 k Ω) to ignition coil.
Set spark gap to 5 mm.
Start engine.
Sparks must appear across spark gap.

Are primary signal and/or ignition sparks in spark gap present?

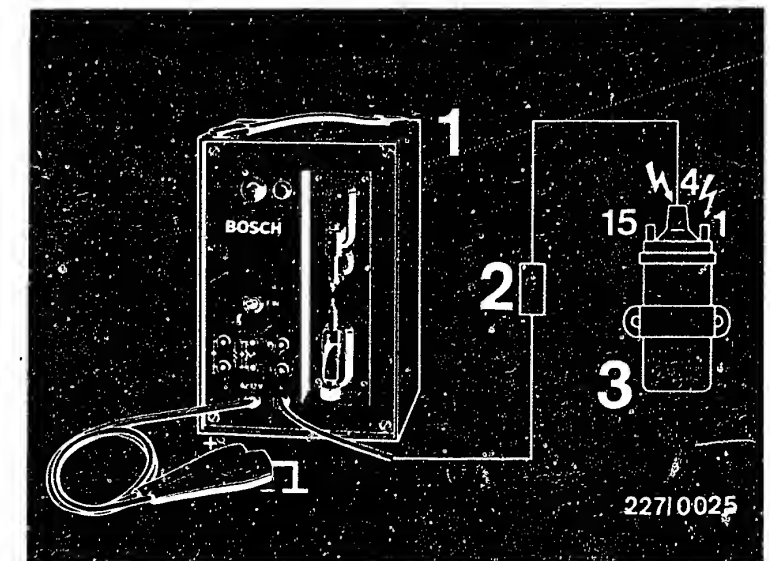
yes

Continued on C 19/C 20

no

If no primary signal or ignition spark is present, continue test at coordinate F 1.

Test beginning at C 19 not necessary.



1 = Spark discharge tester

2 = 5 k Ω sleeve-type suppressor

3 = Ignition coil

Danger arrows: Warning: 400 V...25 kV

C17

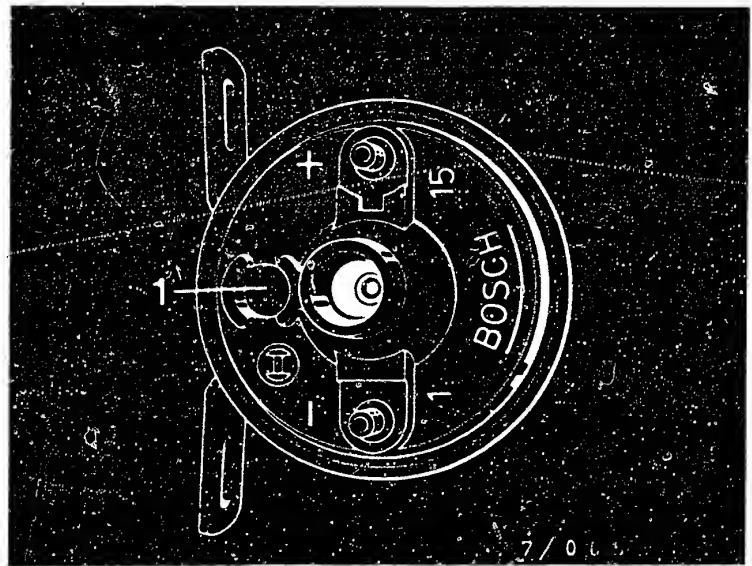
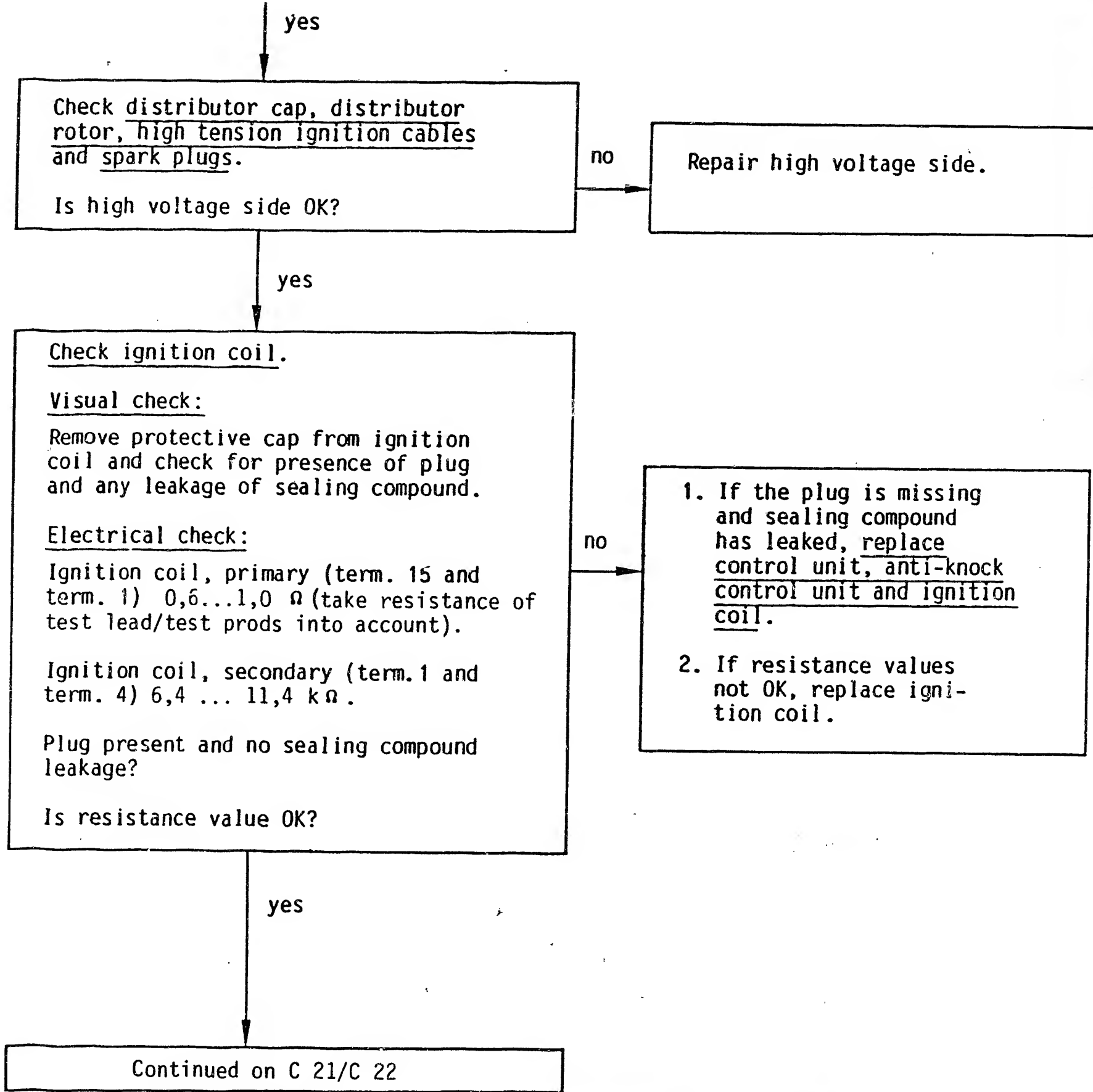
Trouble-shooting program
Volvo



C18

Trouble-shooting program
Volvo





1 = Plug

yes
Engine running above idle speed? no

yes

Continued on C 23/C 24

Step 1

Disconnect positive and negative battery cables. Disconnect trigger-box plug after pressing wire retainer. Switch on ignition.

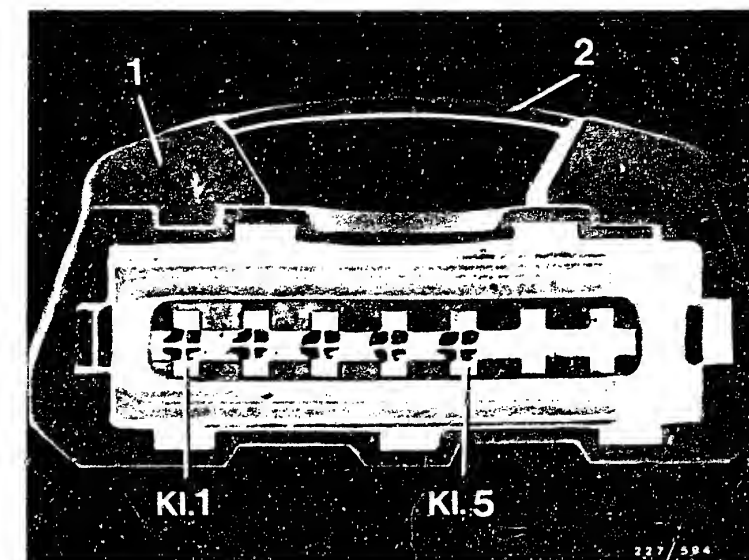
Check leads from positive battery terminal to control unit connector terminal 4 and from negative battery terminal to control unit connector terminal 2 for contact resistance. Max. total contact resistance 0.3Ω (take resistance of test lead/test prod into account). Eliminate contact resistance.

Check leads from positive battery terminal to ignition coil terminal 15 and the lead from ignition coil terminal 1 to control unit connector terminal 1 for contact resistance. Max. total contact resistance 0.3Ω (take resistance of test lead/test prods into account). Eliminate contact resistance.

Step 2

Reconnect battery. Attach dwell angle tester to ignition coil as per operating instructions. Start engine. Dwell angle tester must indicate 27 ... 33% (only during starting). If dwell angle not correct, replace EZ-K control unit.

If steps 1 and 2 were OK, replace control unit.



1 = Trigger-box plug
2 = Wire retainer



yes

Check diagnosis connector

1. Connect evaluation unit KDAW 9980 to battery positive and diagnosis connection (see top picture). Switch on ignition (do not start engine). Fault lamp (evaluation unit) must light up.

2. Start engine and briefly run up to $> 1000 \text{ min}^{-1}$. Then run at idle. Fault lamp is OFF or may indicate flashing pulses.

Is voltage under 1 and 2 above OK?

no

1. If fault lamp did not light up in item 1, disconnect EI-K control-unit plug (bottom picture) and examine lead from EI-K control-unit plug term. 3 to diagnosis connection for open-circuit.

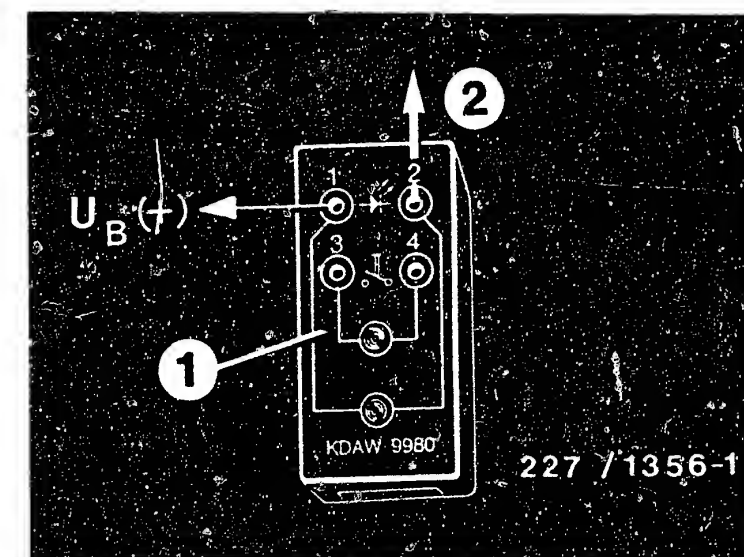
Eliminate open circuit.

If there was no open circuit, replace EI-K control unit.

2. If fault lamp lights up continuously in item 2, check lead from EI-K control-unit plug term. 3 to diagnosis connection for short-circuit to ground.

Eliminate short circuit to ground.

If there was no short circuit to ground, replace EI-K control unit.

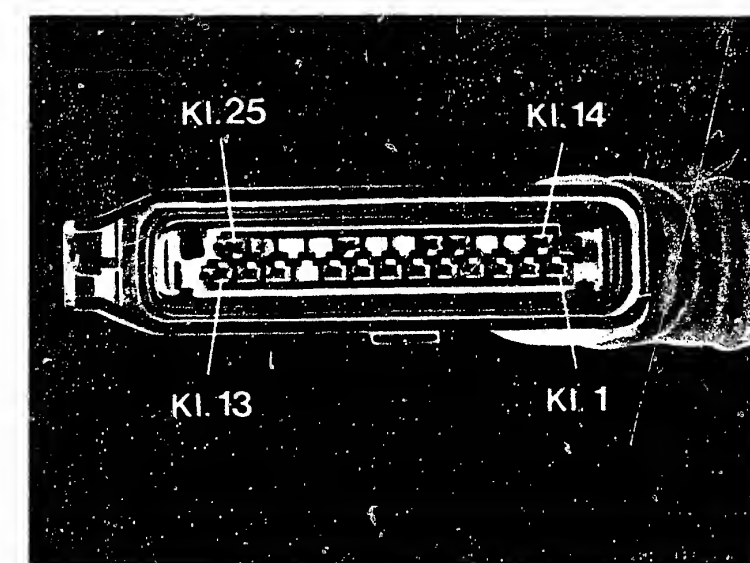


1 = Evaluation unit KDAW 9980
2 = to diagnosis connection

yes

Continued on D1/D2

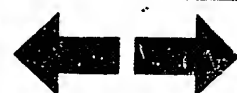
EI-K control unit



C23

Trouble-shooting program

Volvo



C24

Trouble-shooting program

Volvo



yes

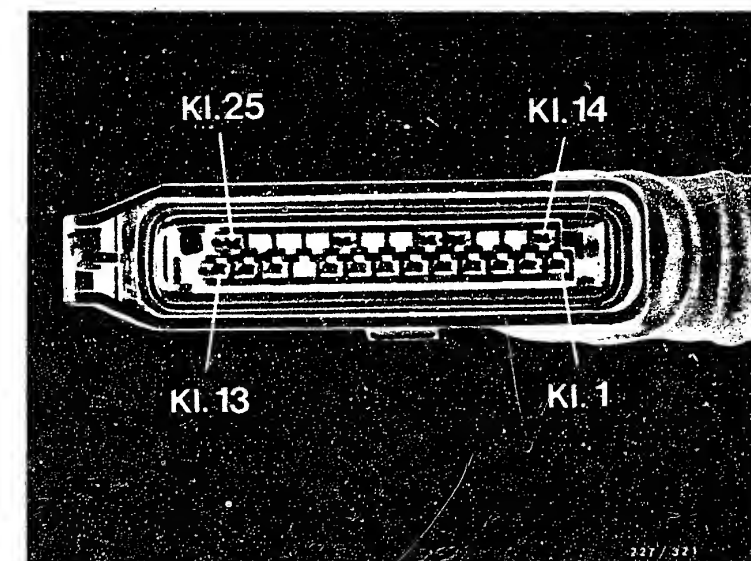
Check microswitch idle contact
Switch off ignition. Disconnect EZ-K control-unit plug. See picture.
Connect ohmmeter to disconnected EZ-K control-unit plug term. 7 and terminal 20.
Accelerator pedal is at idle position.
Ohmmeter must indicate approx. 0 Ω (continuity).
Actuate accelerator pedal so that throttle valve opens 1...2° (idle contact open).
Ohmmeter must now indicate $\infty\Omega$ (open circuit).
Resistance values O.K.?

no

1. Disconnect both microswitch plugs. See bottom picture (new version not illustrated).
Connect ohmmeter, one after the other, to:

| <u>Microswitch plug</u> | | <u>EZ-K control-unit plug</u> |
|---|-----|-------------------------------|
| Term. 7 (orange lead) | and | term. 7 |
| Ohmmeter must indicate approx. 0 Ω (continuity). If $\infty\Omega$ indicated, eliminate open circuit. | | |
| <u>Microswitch plug</u> | | <u>EZ-K control-unit plug</u> |
| Term. 20 (black lead) | and | term. 20 |
| Ohmmeter must indicate approx. 0 Ω (continuity). If $\infty\Omega$ indicated, eliminate open circuit. | | |

2. If there was no open circuit, replace micro-switch.

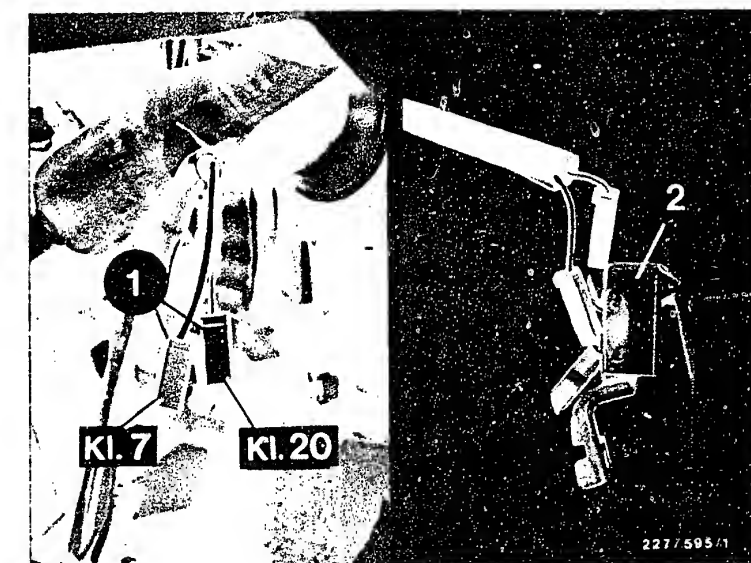


EZ-K control-unit plug

1 = Microswitch
2 = Microswitch (removed)

yes

Continued on D 3/D 4



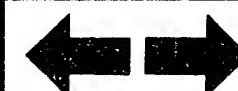
D1

Trouble-shooting program
Volvo



D2

Trouble-shooting program
Volvo



Yes

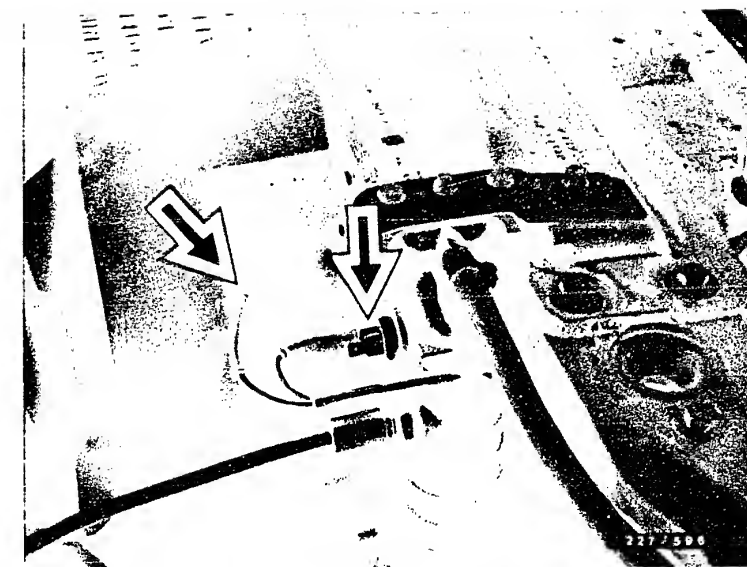
Test basic ignition setting.

Vehicles with air conditioning and tropics radiator only; disconnect plug of boiling-protection switch. See arrow in upper illustration.

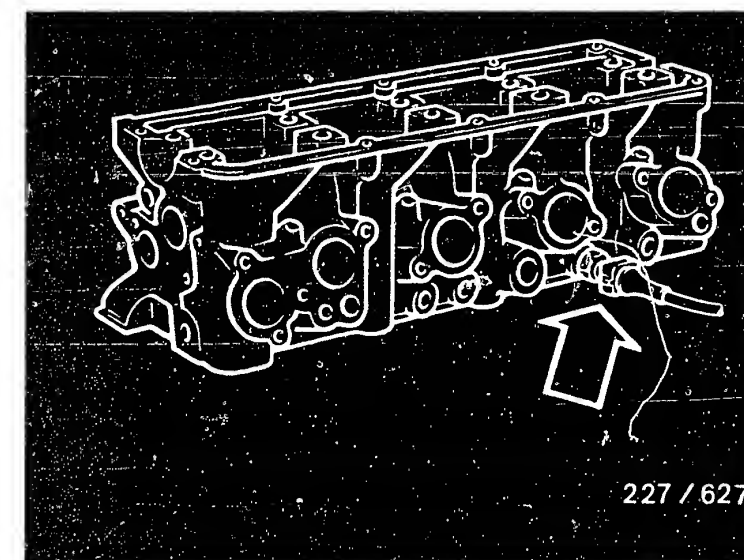
Disconnect coolant temperature sensors plug. See lower illustration. Engine at operating temperature (coolant temperature $> 60^{\circ}$).

Yes

Continued on D5/D6



Coolant temperature sensor



227 / 627

D3

Trouble-shooting program
Volvo



D4

Trouble-shooting program
Volvo



Yes

Start engine and run it briefly at speed $> 1000 \text{ min}^{-1}$ and then at $750 \dots 950 \text{ min}^{-1}$.

Caution:

Microswitch (idle contact) must be closed.

Switch off AC.

With vehicles with automatic transmission, set selector lever to position "P"/"N". (If a clearly incorrect speed reading is obtained with test equipment, connect in a series resistor or convert the Motortester).

View the timing marks with a stroboscope.

Basic ignition setting must be $15 \pm 1^\circ \text{ BTDC}$. See upper illustration.

Basic ignition setting correct?

No

1. Switch off ignition.

Remove EZ-K control unit and disconnect plug. Push back handle cover of EZ-K control unit plug after removing securing screws and rubber seal. Connect up EZ-K control unit plug. See lower illustration. Connect positive lead of voltmeter to EZ-K control unit plug term. 9 and negative lead to term. 20. Let engine idle.

Voltmeter must read approx. 0 V.

If a battery voltage reading is obtained, eliminate positive connection.



Ignition timing mark

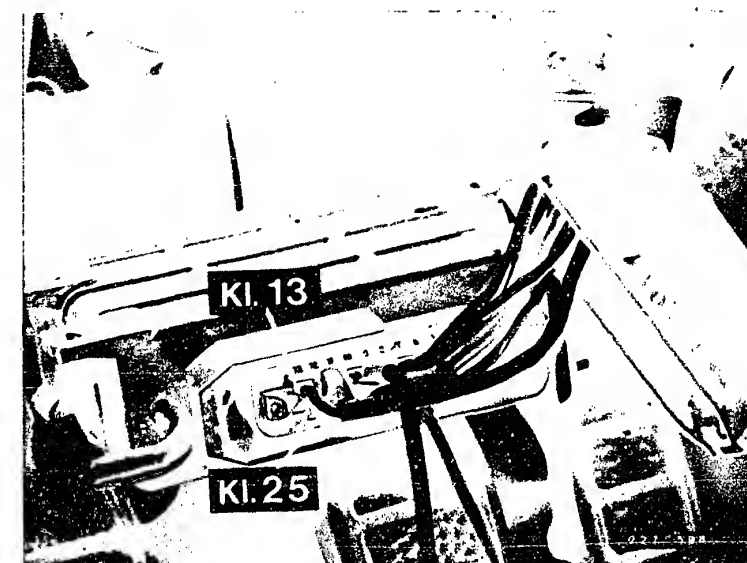
Yes

Connect up boiling-protection switch or coolant temperature sensor.

Yes

Continued on D9/D10

Continued on D7/D8



D5

Trouble-shooting program

Volvo



D6

Trouble-shooting program

Volvo



Continued

2. If there was no positive connection, loosen ignition distributor mounting (arrow, top picture) and turn ignition distributor until $15 \pm 1^\circ$ BTDC is obtained.



yes

Continued on D 9/D 10

Ignition timing mark



D7

Trouble-shooting program

Volvo

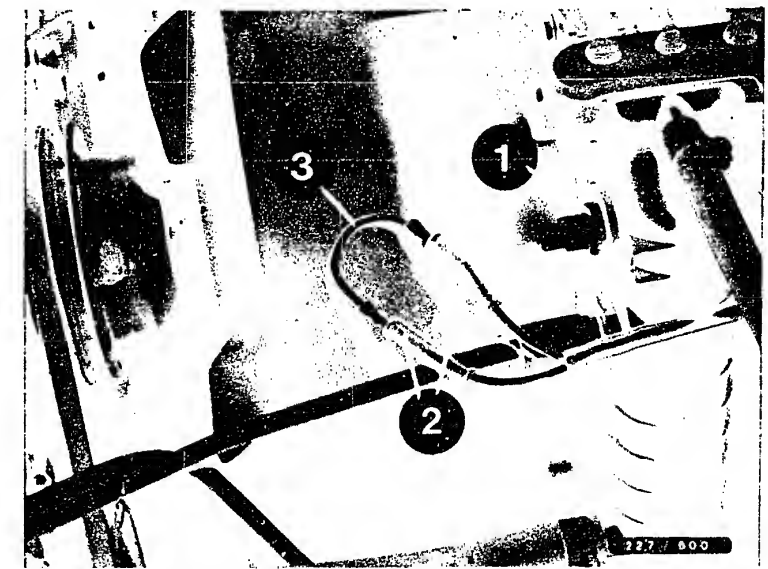
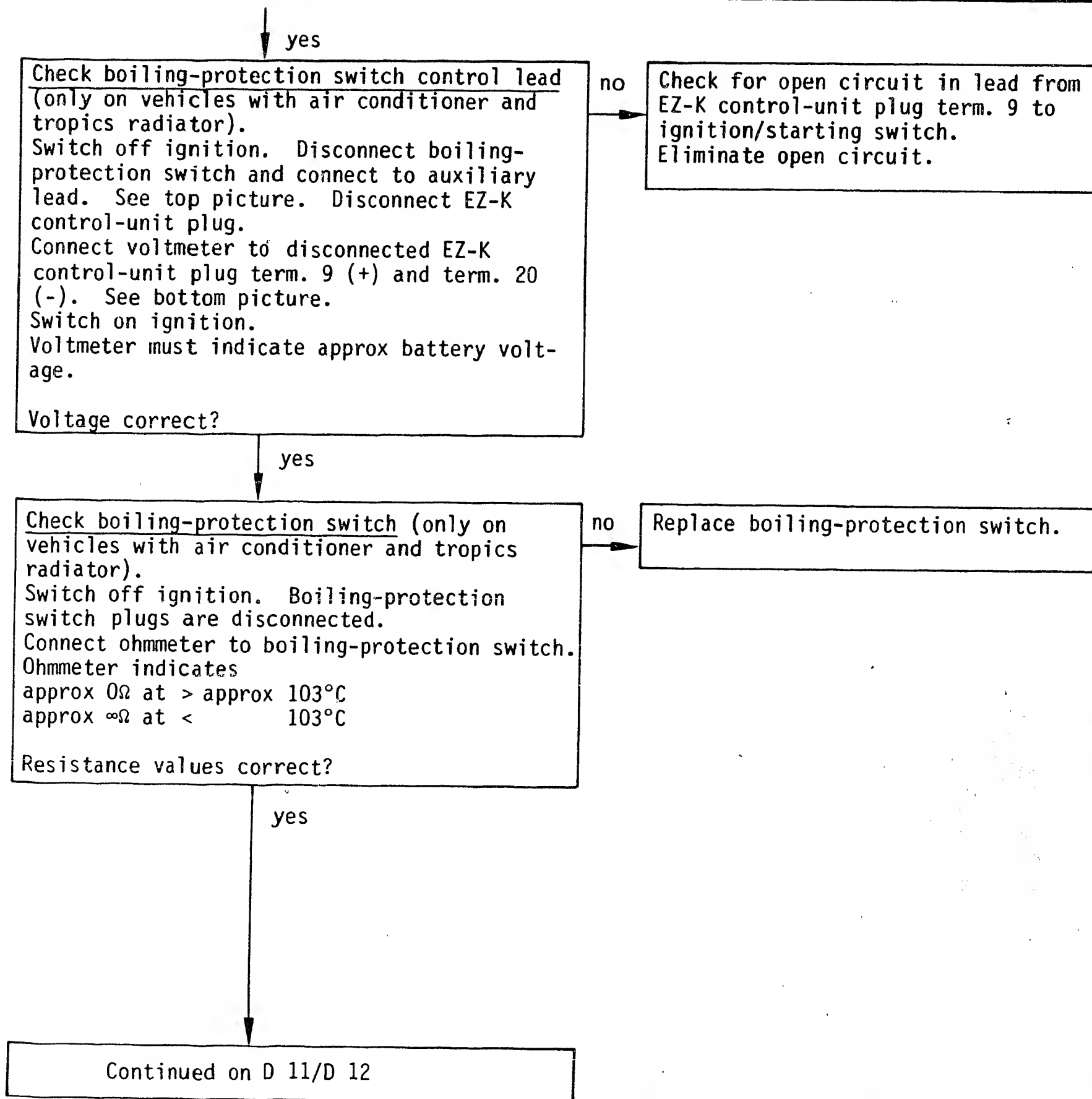


D8

Trouble-shooting program

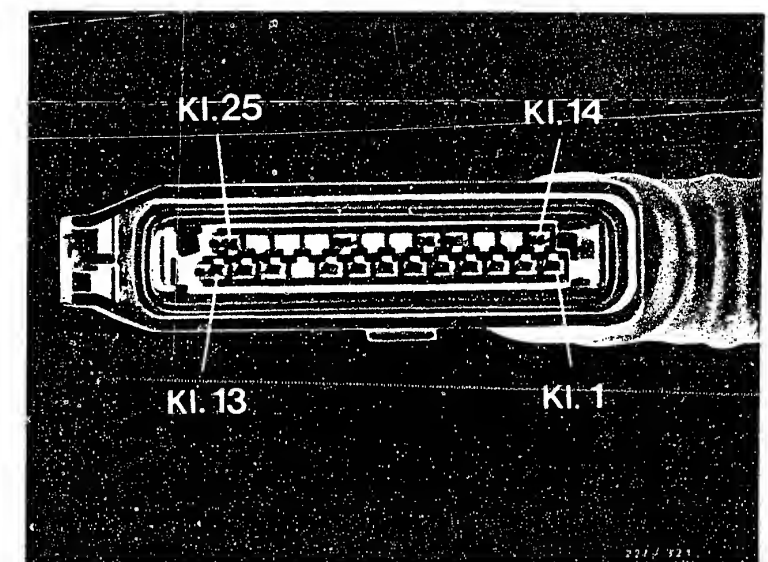
Volvo





1 = Boiling-protection switch
2 = Boiling-protection switch plug
3 = Auxiliary lead

EZ-K control-unit plug



D9

Trouble-shooting program
Volvo



D10

Trouble-shooting program
Volvo



yes

Check fan motor
(only on vehicles with air conditioner and
tropics radiator).

Remove both anti-boilover switch
connectors and bridge them with an
auxiliary lead. See top photograph.

Switch on ignition.

Fan motor must run.

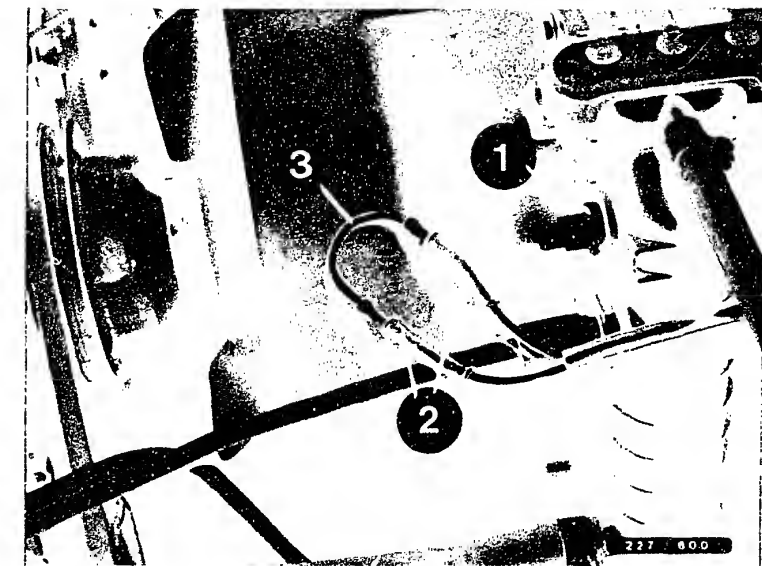
Does fan motor run?

no

Check lead from anti-boilover
switch connector to fan motor
and motor ground connection
for continuity.

Eliminate discontinuity.

If no discontinuity is found,
replace fan motor.

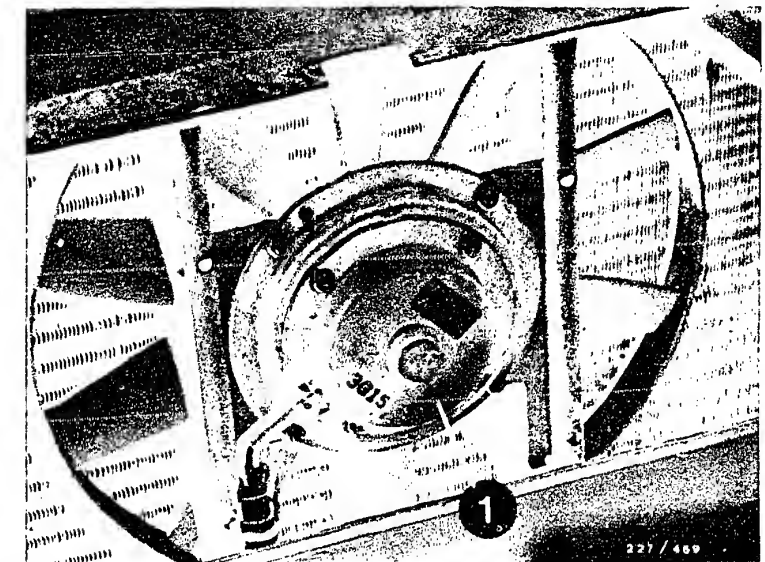


- 1 = Anti-boilover switch
- 2 = Anti-boilover switch
connector
- 3 = Auxiliary lead

yes

Continued on D 13/D 14

Fan motor



D11

Trouble-shooting program
Volvo



D12

Trouble-shooting program
Volvo



Yes

Test coolant temperature sensor.

Switch off ignition.

Disconnect EZ-K control unit plug and connect ohmmeter to term. 11 and 25. For resistance values, see table.

| Coolant temperature | Resistance values |
|---------------------|-----------------------|
| 20° C | 2.1...2.9k Ω |
| 30° C | 1.4...2.0k Ω |
| 40° C | 0.96...1.35k Ω |
| 80° C | 280...370 Ω |
| 90° C | 210...280 Ω |

Resistance values correct for specified coolant temperature?

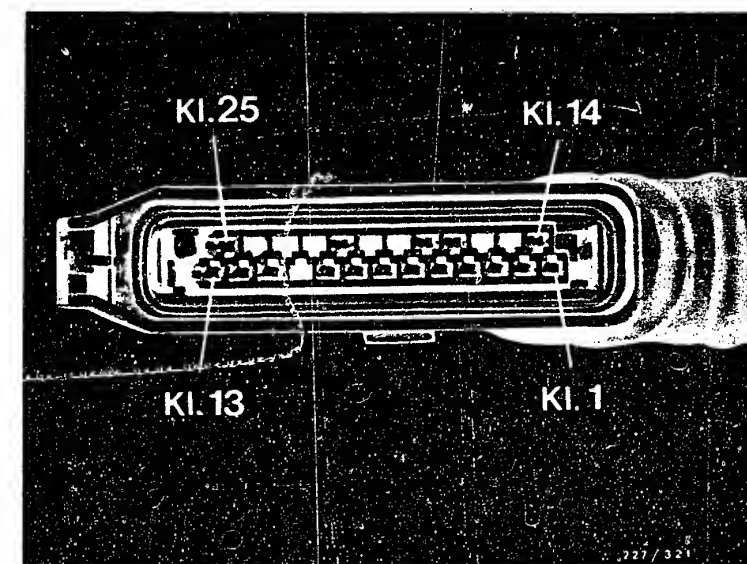
No

1. If ohmmeter reads $\infty\Omega$, disconnect coolant temperature sensor plug. See lower illustration. Connect ohmmeter in turn to:

| Coolant temperature sensor plug | EZ-K control unit plug |
|---------------------------------|------------------------|
| Term. 11 | and term. 11 |
| Term. 25 | and term. 25 |

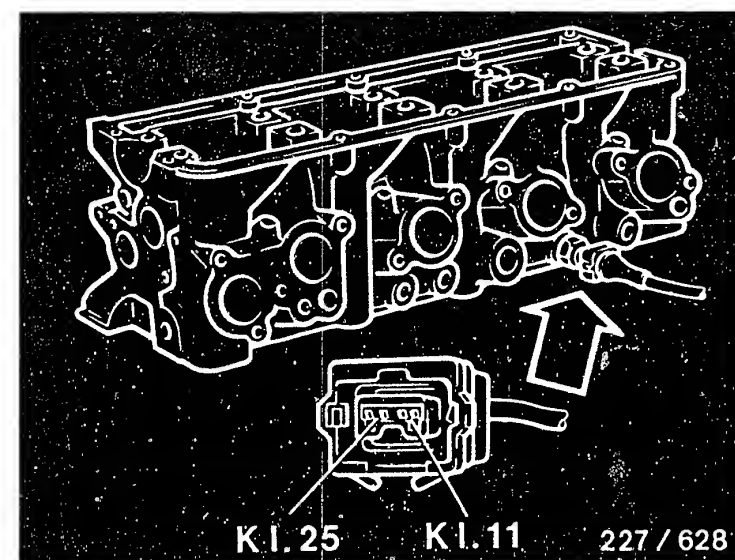
Ohmmeter must read approx. 0 Ω (continuity) in each case. Eliminate any open circuit.

2. If resistance values are different from above, replace coolant temperature sensor.



EZ-K control unit plug

Coolant temperature sensor
KI. = Terminal



Yes

Continued on D 15/D 16

D 13

Trouble-shooting program

Volvo



D 14

Trouble-shooting program

Volvo



yes

Check boiling-protection function (only on vehicles with air conditioner and tropics radiator).

Disconnect boiling-protection switch plug and connect to auxiliary lead. See upper illustration.

Engine at operating temperature (coolant temperature $> 60^{\circ}\text{C}$).

Start engine, run it briefly at $> 1000\text{ min}^{-1}$ and then let it idle.

Microswitch idle contact closed. (In case of clearly incorrect reading of engine speed on testers, connect in series resistor or convert motortester).

Aim timing light at ignition mark.

Spark advance must be $21^{\circ} \dots 25^{\circ}$ BTDC.

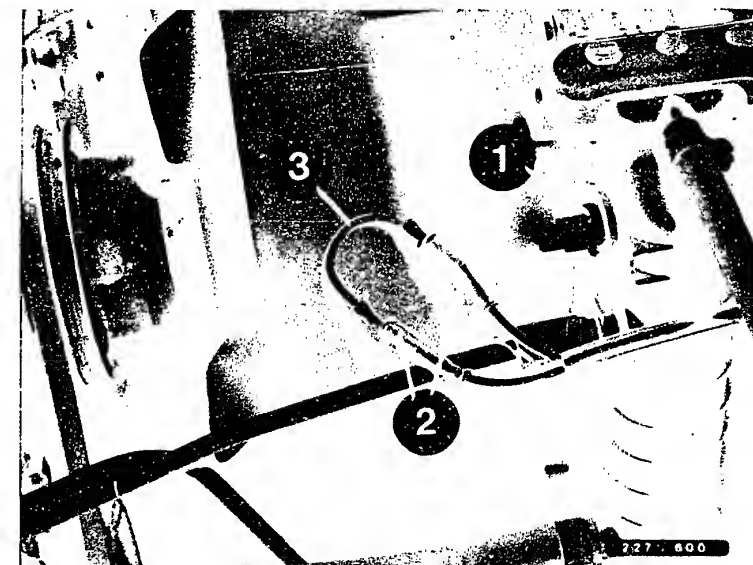
Spark advance correct?

no

Replace EZ-K control unit.

yes

Continued on D 17/D 18



- 1 = Boiling-protection switch
- 2 = Boiling-protection switch plug
- 3 = Auxiliary lead

Ignition timing mark



D15

Trouble-shooting program

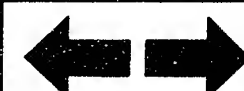
Volvo

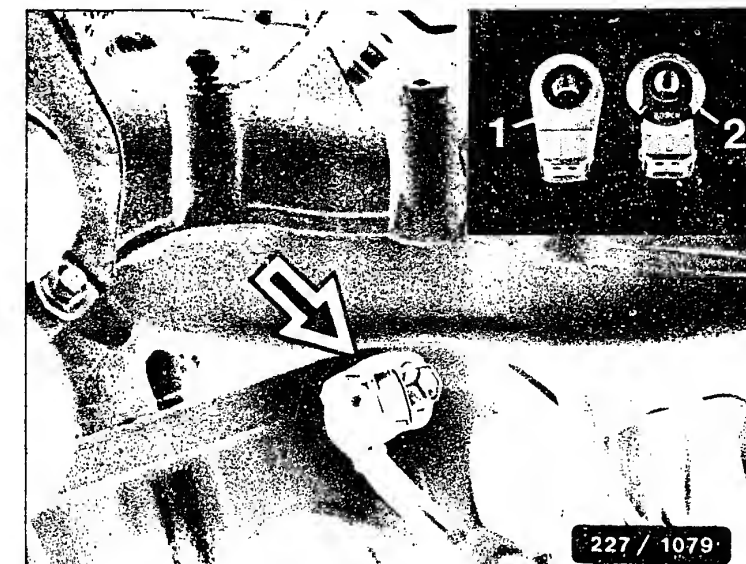
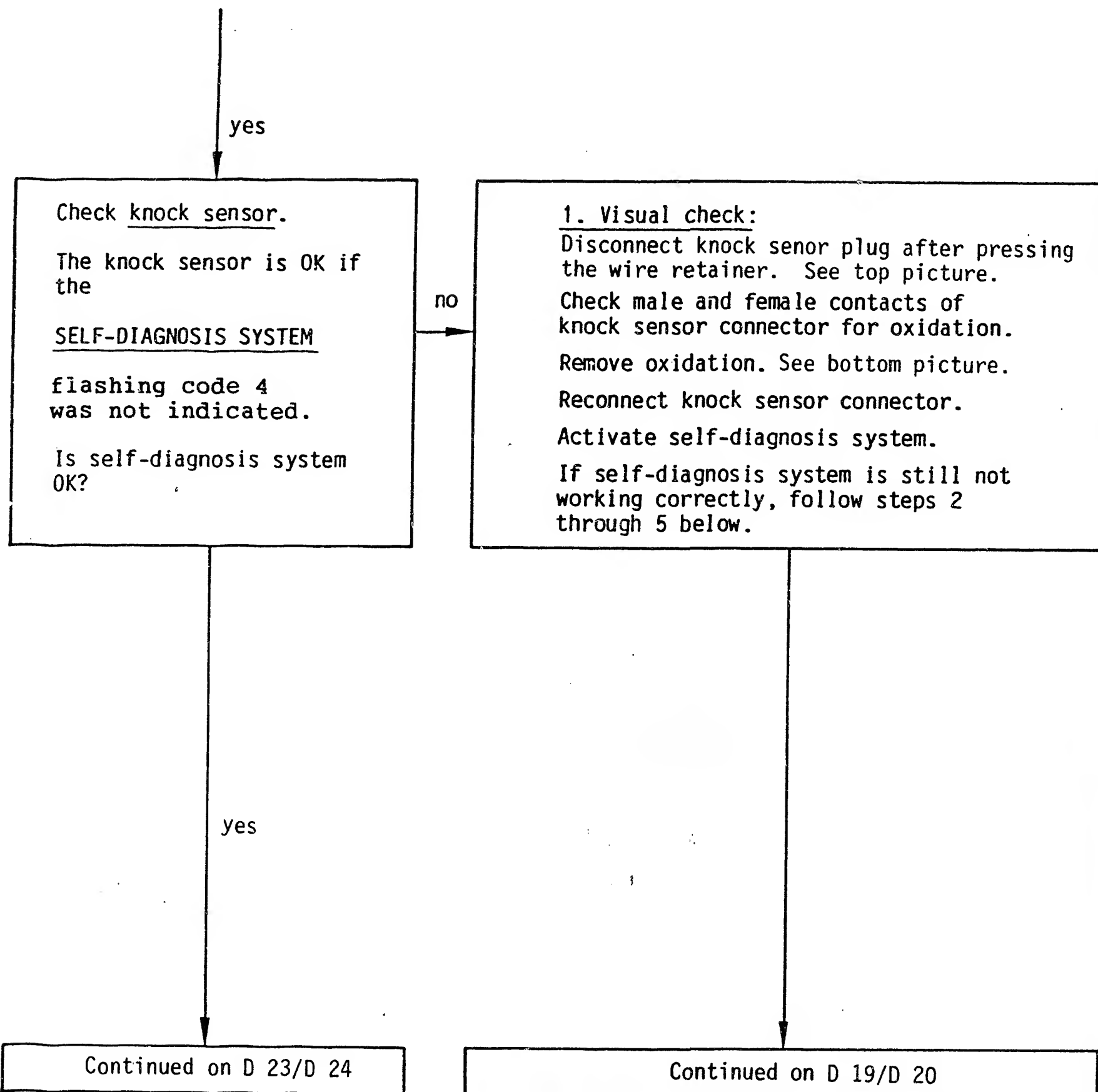


D16

Trouble-shooting program

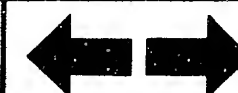
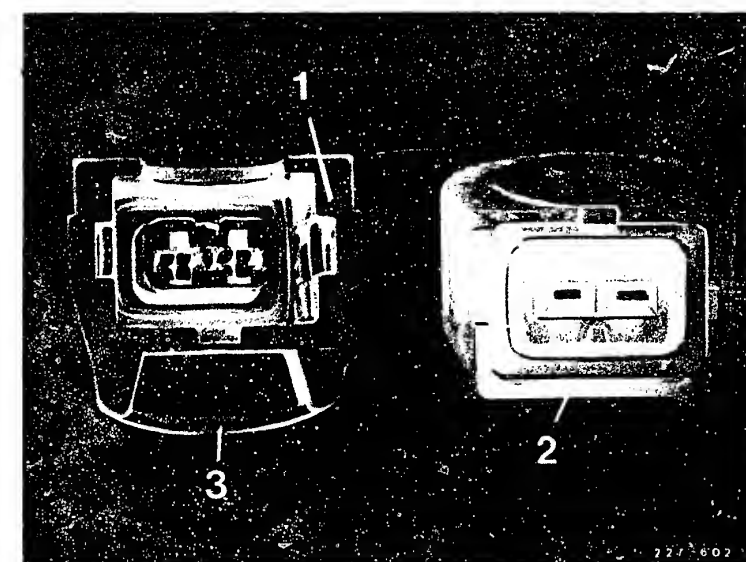
Volvo





Arrow = Knock sensor
1 = Old version
2 = New version

1 = Knock sensor plug
2 = Knock sensor socket
3 = Wire retainer



Continued

Switch off ignition.
Disconnect knock sensor plug and EZ-K control-unit plug.

2. Connect ohmmeter to:

| <u>Knock sensor</u> | | <u>EZ-K control-unit</u> |
|---------------------|-----|--------------------------|
| <u>plug</u> | | <u>plug</u> |
| Term. 12 | and | term. 12 |
| Term. 13 | and | term. 13 |

Ohmmeter must indicate approx 0Ω (continuity).
Eliminate open circuit.

3. Connect ohmmeter to:

| <u>Knock sensor</u> | | <u>EZ-K control-unit</u> |
|---------------------|-----|--------------------------|
| <u>plug</u> | | <u>plug</u> |
| Term. 13 | and | term. 20 |

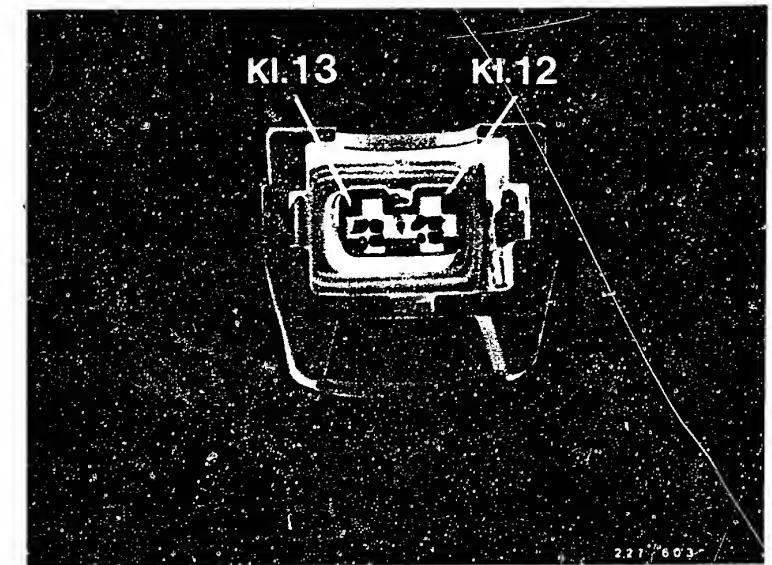
Ohmmeter must indicate $\infty\Omega$. If ohmmeter indicates approx 0Ω (continuity), eliminate short circuit to ground between knock sensor lead term. 13 and term. 20.

4. Conduct only on the "old" knock-sensor version.
Connect knock-sensor plug and connect ohmmeter to:

| <u>EZ-K control-unit</u> | | <u>EZ-K control-unit</u> |
|--------------------------|-----|--------------------------|
| <u>plug</u> | | <u>plug</u> |
| Term. 12 | and | term. 13 |

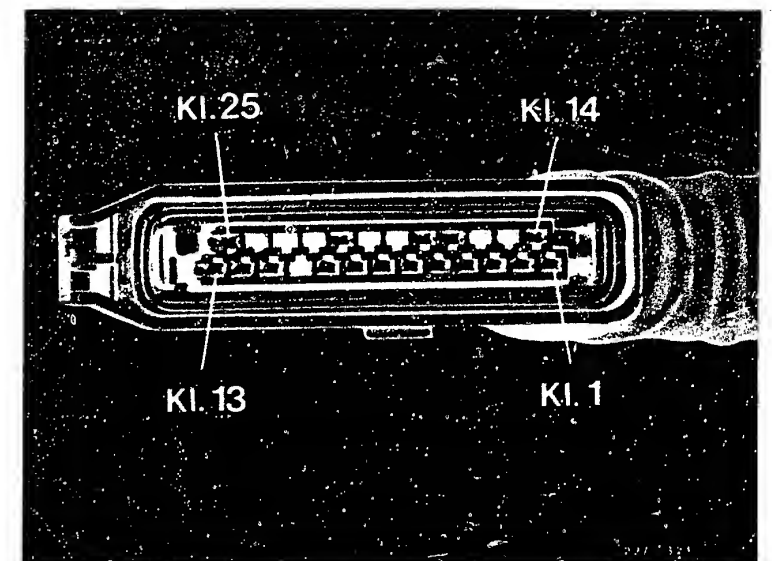
Ohmmeter must indicate 270...330 k Ω
If resistance value not correct, replace knock sensor.

yes



Knock sensor plug

EZ-K control-unit plug



Continued on D 23/D 24

Continued on D 21/D 22

D 19

Trouble-shooting program
Volvo



D 20

Trouble-shooting program
Volvo



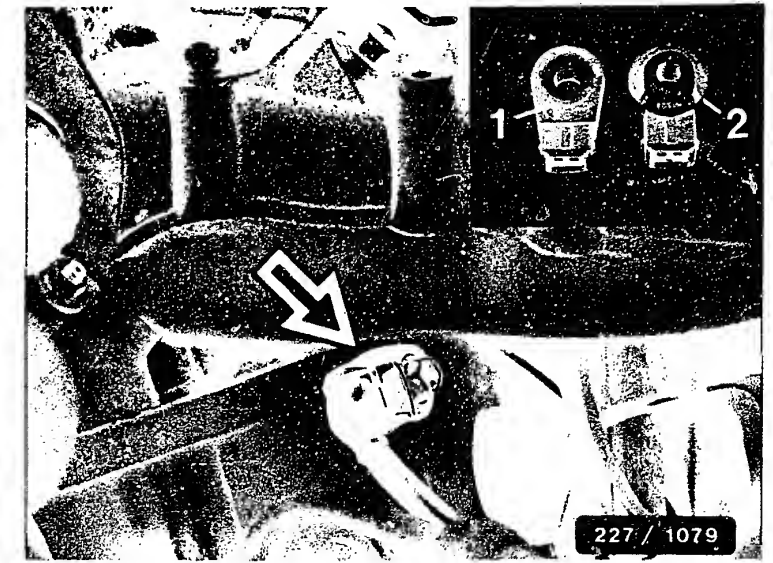
Continued

5. Tightening torque:

| | |
|-------------|--------------|
| Old version | 11 ... 15 Nm |
| New version | 15 ... 25 Nm |

If points 1 ... 5 O.K.,
replace knock sensor.
Self-diagnosis reactivates.

If flashing code 4 is still indicated,
re-install previously removed knock
sensor and renew EI-K control unit.



Arrow = Knock sensor
1 = Old version
2 = New version

yes

Continued on D 23/D 24

D21

Trouble-shooting program
Volvo



D22

Trouble-shooting program
Volvo



yes

Check operation of vacuum sensor.

Disconnect vacuum hose (1) from intake manifold (1)

Connect vacuum pump (2) to disconnected vacuum hose. See top picture.

Remove steering column cover. Disconnect 1 connector from microswitch. See arrow, center picture (new version not illustrated).

Operate engine at approx 3000 min⁻¹. Adjust manual adjustment (delay) on ignition timing light until approx 10° BTDC is indicated. See bottom picture.

Build up approx 700 mbar with vacuum pump.

Ignition timing must move in "ADVANCE" direction.

Ignition timing ADVANCED?

yes

Connect microswitch plug (to both outer connections - arrow, center picture).

Connect vacuum hose (1).

yes

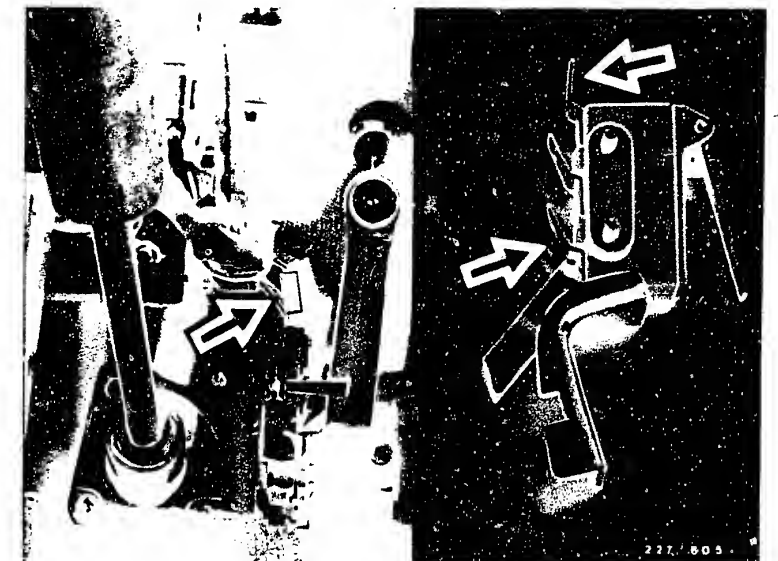
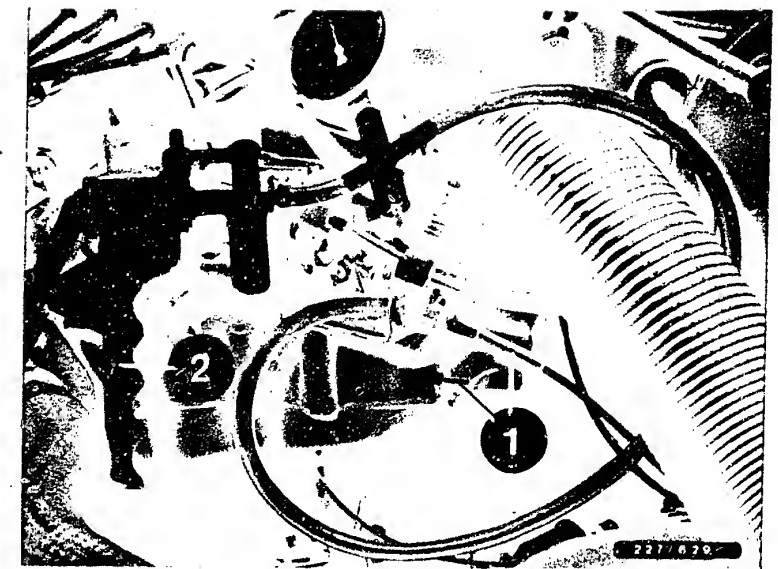
Continued on E 1/E 2

no

Check vacuum hose (1) between intake manifold (2) and EZ-K control unit for leaks.

Eliminate leaks.

If there was no leak, replace EZ-K control unit.



D23

Trouble-shooting program

Volvo

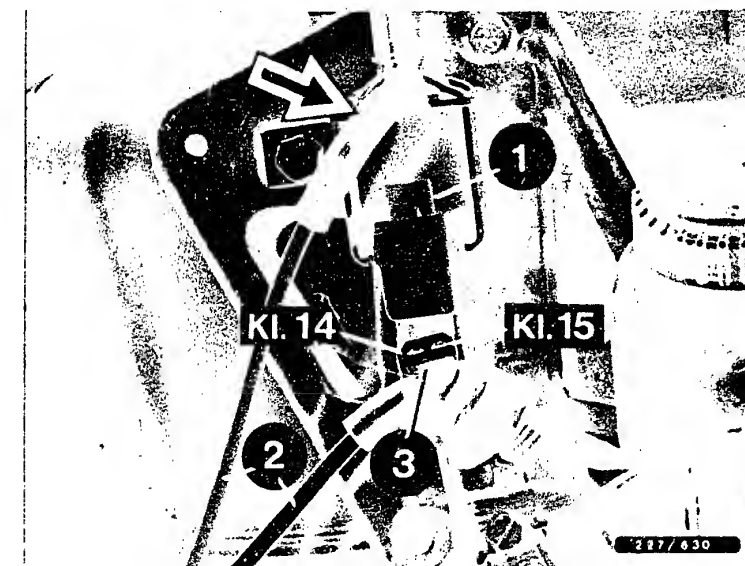
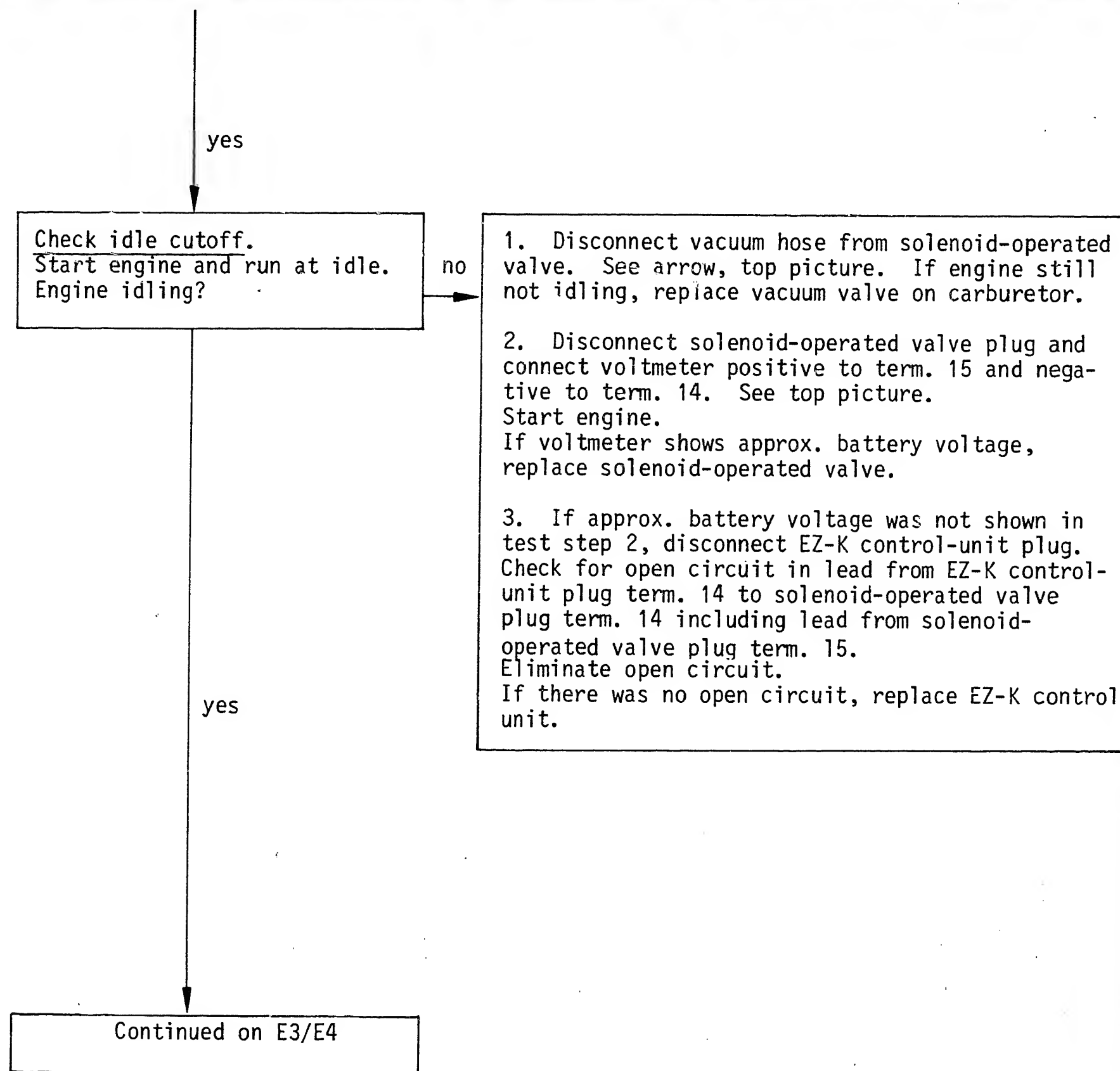


D24

Trouble-shooting program

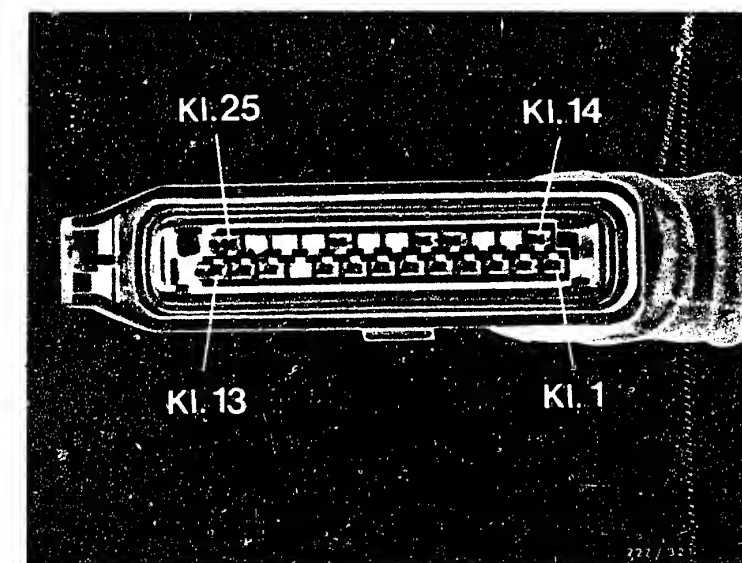
Volvo





- 1 = Solenoid-operated valve
2 = Vacuum hose
3 = Solenoid-operated valve plug

EZ-K Control-unit plug



E1

Trouble-shooting program
Volvo



E2

Trouble-shooting program
Volvo



Test overrun fuel cut-off

1. Mechanical test

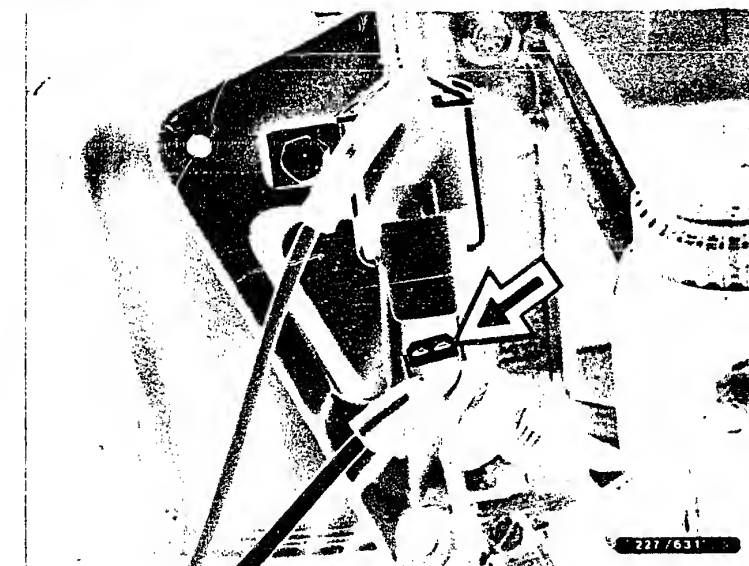
Let engine idle.
Disconnect solenoid valve plug.
See illustration. Engine must die.

No

Check vacuum hoses from carburetor to solenoid valve or from solenoid valve to vacuum valve for leaks.
Eliminate any leaks.
Check operation of solenoid valve or vacuum valve.
See lower illustration.

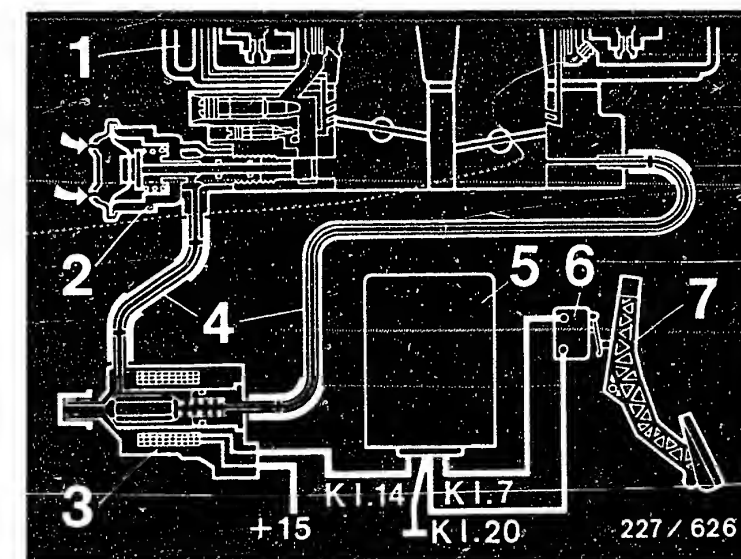
Yes

Continued on E5/E6



- 1 = Carburetor
- 2 = Vacuum valve
- 3 = Solenoid valve
- 4 = Vacuum hose
- 5 = EZ-K control unit
- 6 = Microswitch
- 7 = Accelerator pedal

K1. = Terminal



E3

Trouble-shooting program
Volvo



E4

Trouble-shooting program
Volvo



Yes

2. Electrical test

Disconnect coolant temperature sensor plug and bridge with auxiliary lead (1). See upper illustration. Connect up solenoid valve plug, push back rubber sleeve and connect voltmeter with positive lead to term. 15 and negative lead to term. 14. See lower illustration. Accelerate engine to approx. 3000 min⁻¹ using accelerator (not throttle valve). Voltmeter must read approx. battery voltage. Release accelerator abruptly (thus closing microswitch); voltmeter reading must fall briefly to approx. 0 V. Voltage correct?

No

Disconnect EZ-K control unit plug and connect up ohmmeter as follows:

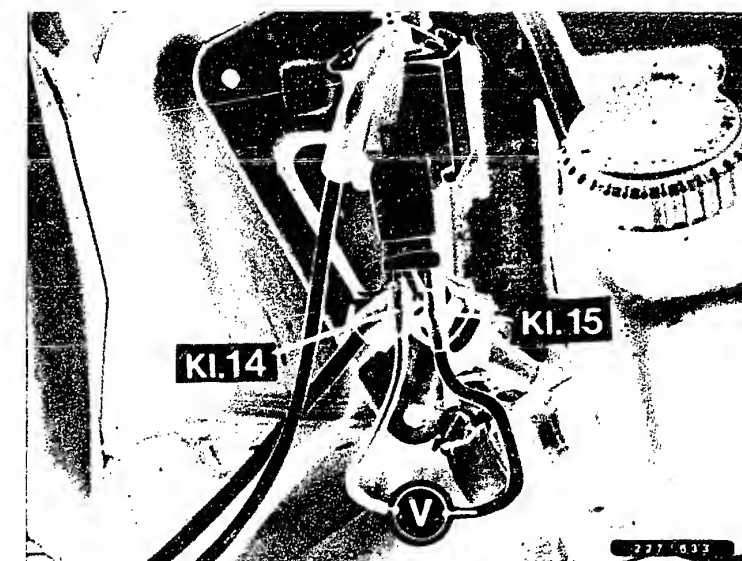
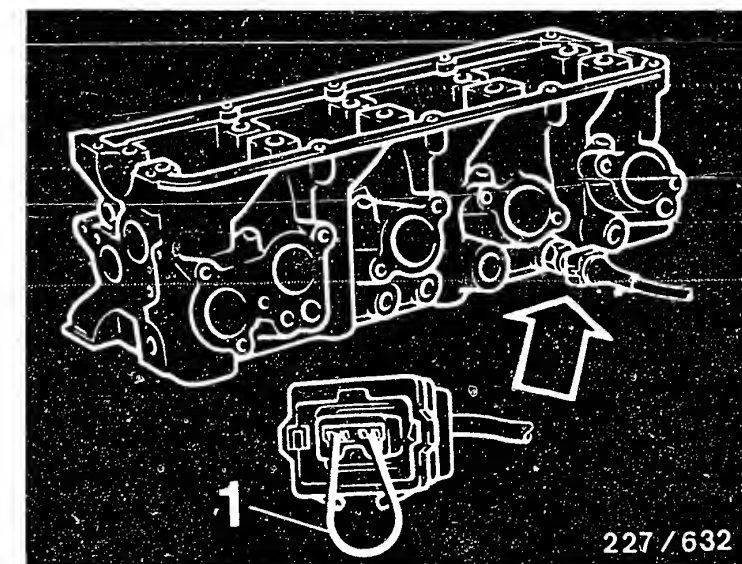
| <u>EZ-K control unit plug</u> | | <u>EZ-K control unit plug</u> |
|-------------------------------|-----|-------------------------------|
| Term. 25 | and | Term. 11 |
| Term. 7 | and | Term. 20 |

Ohmmeter must read approx. 0Ω (continuity) in each case.
Eliminate any open circuits.

Yes

Continued on E9/E10

Continued on E7/E8



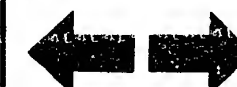
E5

Trouble-shooting program
Volvo



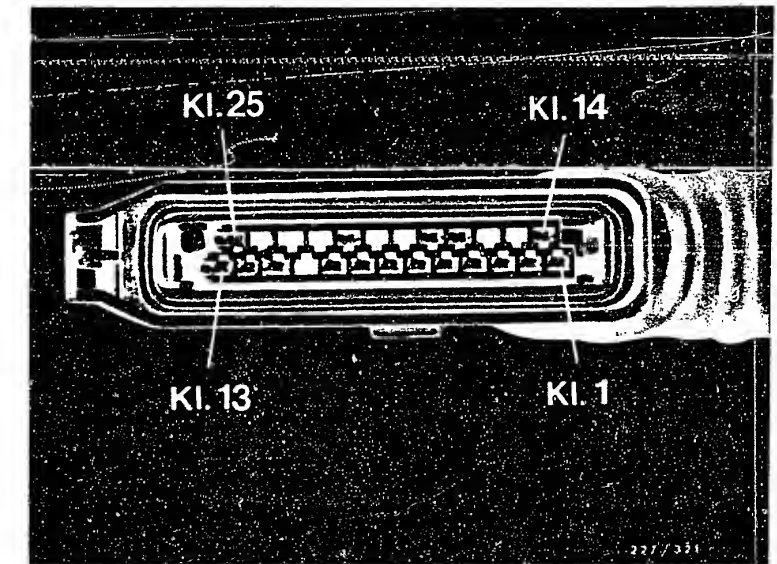
E6

Trouble-shooting program
Volvo



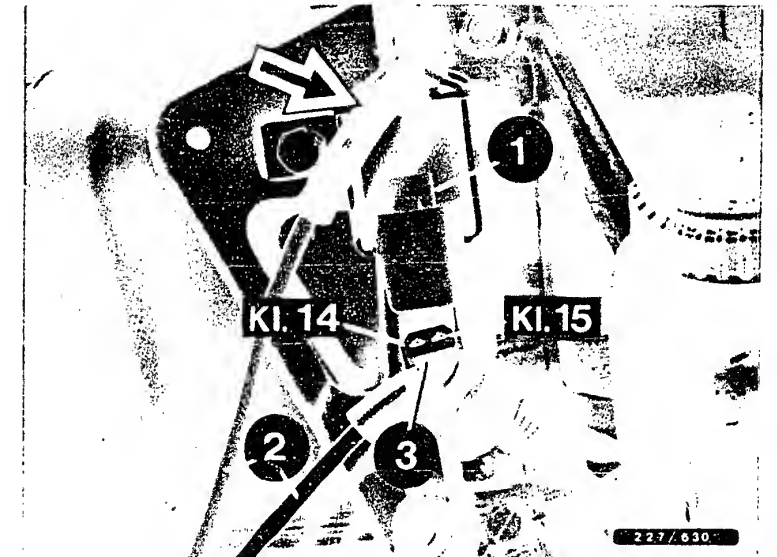
Continuation

Disconnect solenoid valve plug, and test lead from EZ-K control plug to term. 14 to solenoid valve plug term. 14, including lead from solenoid valve plug term. 15, for open circuit. See upper and lower illustrations.
Eliminate any open circuits.
If no open circuits have been found, replace EZ-K control unit.



KI. = Terminal

- 1 = Solenoid valve
- 2 = Vacuum hose
- 3 = Solenoid valve plug



yes

Continued on E9/E10

E7

Trouble-shooting program
Volvo



E8

Trouble-shooting program
Volvo



yes

Check trigger box power supply.
Remove top part of air filter.
Remove trigger box with heat sink. Push back rubber sleeve on trigger-box plug. Connect voltmeter with test prods to trigger-box plug term. 4 (+) and term. 2 (-). See top picture.
Operate engine at idle. Measured voltage must be 12 ... 14 V and may be no more than 1 V below battery voltage.

Voltage correct?

yes

Check ignition coil power supply.

Connect voltmeter to ignition coil term. 15 and negative battery terminal. Operate engine at idle. Measured voltage must be 10 V.
Voltage correct?

yes

Continued on E 11/E 12

Disconnect negative and positive cables from battery. Disconnect trigger-box plug after pressing wire retainer. Switch on ignition.

Check for contact resistance in leads from positive battery terminal to trigger-box plug term. 4 including leads between negative battery terminal and trigger-box plug term. 2. Total contact resistance max. 0.3 Ω (take resistance of test lead and test prods into account).

Eliminate contact resistance.

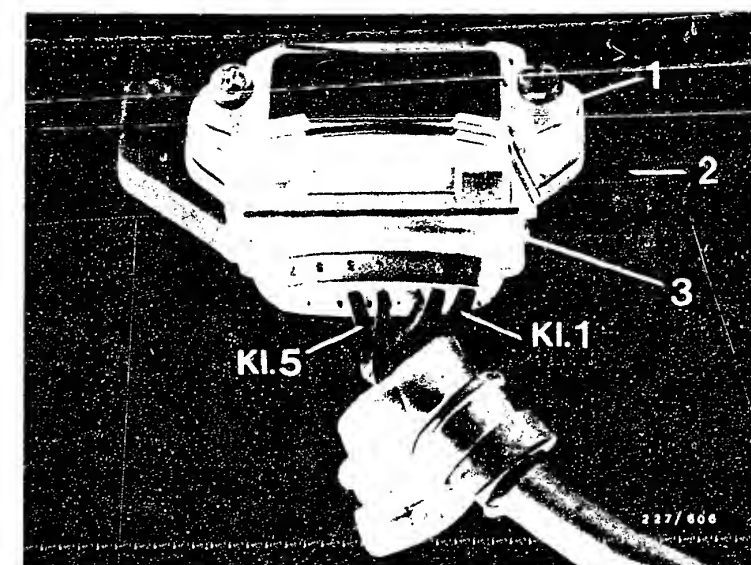
no

Disconnect positive cable from battery. Switch on ignition.

Check for contact resistance in leads between positive battery terminal and ignition coil term. 15. Contact resistance max. 0.3 Ω . (Take resistance of test lead and test prods into account.)

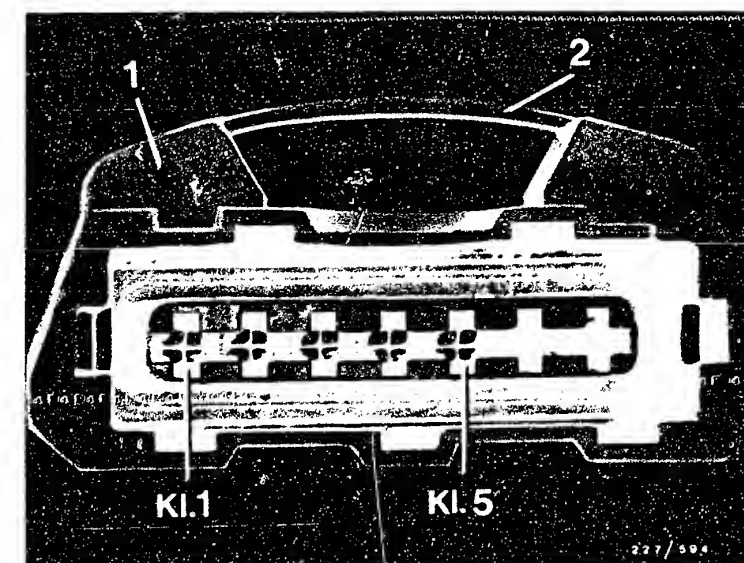
Eliminate contact resistance.

no



1 = Trigger box
2 = Heat sink
3 = Trigger-box plug

1 = Trigger-box plug
2 = Wire retainer



E9

Trouble-shooting program
Volvo



E10

Trouble-shooting program
Volvo



yes

Check primary voltage.

(if MOT series oscilloscope available)

Connect oscilloscope (e.g. MOT 201) together with pulse shaper 1 684 463 154 to ignition coil in accordance with operating instructions.

Note: Incorrect measured value without pulse shaper.

Run engine ad idle.

The primary voltage must be 295 ... 365 V (see illustration).

Is voltage value OK?

no

Replace control unit.

yes

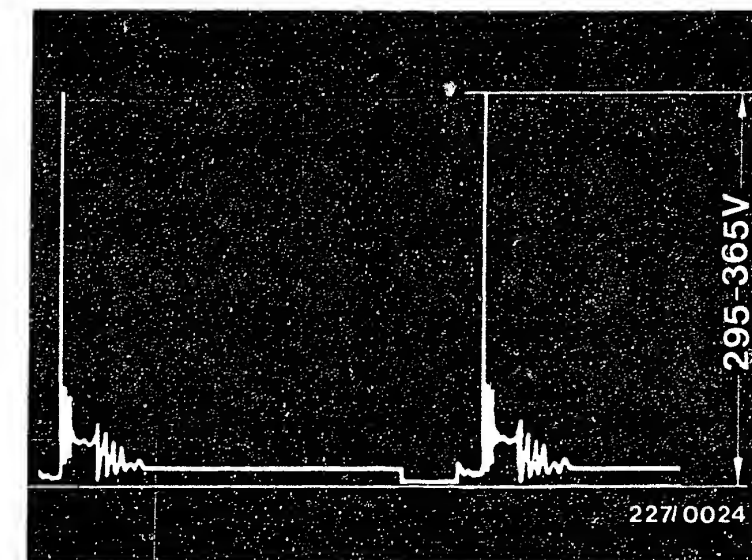
Igniton system OK

Test completed.

Test beginning at coordinate F 1 not necessary.

Note:

If customer complaint still exists, fault may be in fuel system or engine may have mechanical problem.



E11

Trouble-shooting program

Volvo



E12

Trouble-shooting program

Volvo



No primary signal or no ignition spark

(continued from C 17/C 18)

yes

Check voltage from control unit.
Remove top part of air filter.
Disconnect trigger-box plug after pressing wire retainer.
Connect positive lead of voltmeter to terminal 4 and negative lead to terminal 2 of control unit connector.
Switch on ignition.
Voltmeter must indicate battery voltage. Is voltage value O.K.?

no

Check leads and connections between ignition/starter switch and control unit connector terminal 4 and ground lead terminal 2 for discontinuity.
Eliminate discontinuity.

yes

Check primary circuit.

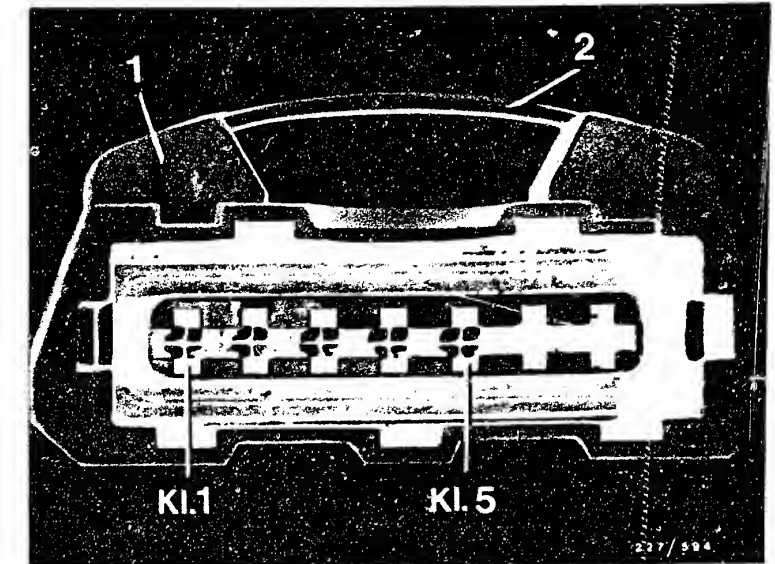
Connect positive lead of voltmeter to terminal 1 and negative lead to terminal 2 of unplugged control unit connector.
Switch on ignition.
Voltmeter must indicate battery voltage.
Is voltage value OK?

no

Check lead from ignition/starter switch to ignition coil terminal 15, the primary winding of the ignition coil, and the lead from ignition coil terminal 1 to control unit connector terminal 1 and ground lead terminal 2 for continuity.
Eliminate discontinuity.

yes

Continued on F 3/F 4



1 = Trigger-box plug
2 = Wire retainer

F1

Trouble-shooting program
Volvo



F2

Trouble-shooting program
Volvo



yes

Check EZ-K control unit power supply.

Switch off ignition.

Disconnect EZ-K control-unit plug.

Connect voltmeter to EZ-K control-unit plug
term. 6 (+) and term. 20 (-).

Switch on ignition.

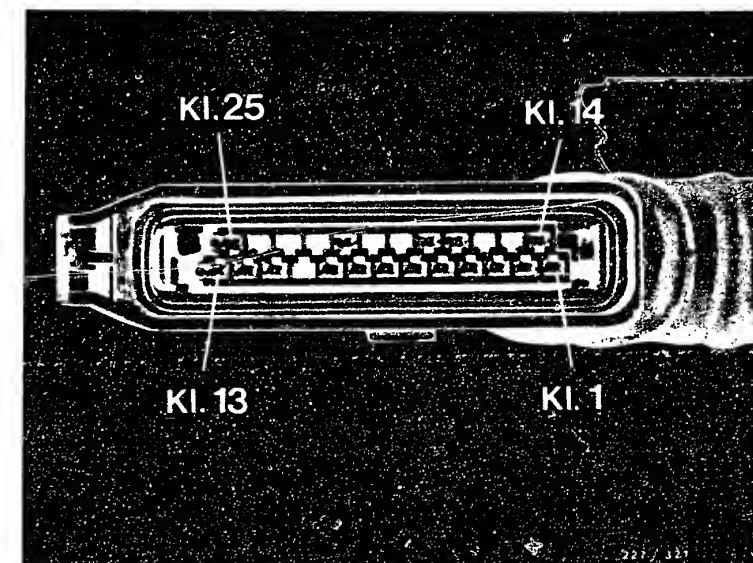
Voltmeter must indicate battery voltage.

Is voltage OK?

no

Check for open circuit in lead from
ignition/starting switch to EZ-K
control-unit plug term. 6 including
ground lead term. 20.

Eliminate discontinuity.



EZ-K control-unit plug

yes

Continued on F 5/F 6

F3

Trouble-shooting program

Volvo



F4

Trouble-shooting program

Volvo



yes

Check male and female halves of
ignition distributor connector.

Disconnect ignition-distributor plug
after pressing wire retainer (arrow).

Unplug ignition distributor connector.

Visual check:

Check male and female contacts of
ignition distributor connector for
oxidation.

Remove oxidation.

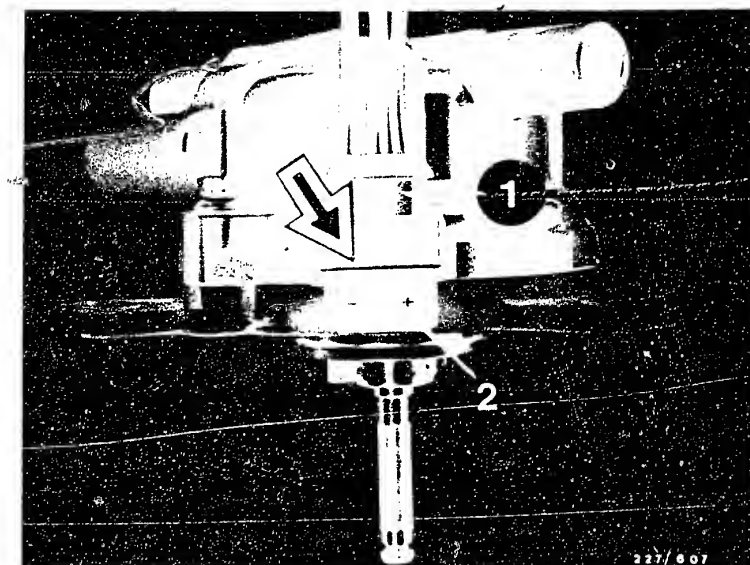
Reconnect ignition distributor
connector.

Start engine.

If no primary signal or ignition
spark, continue test.

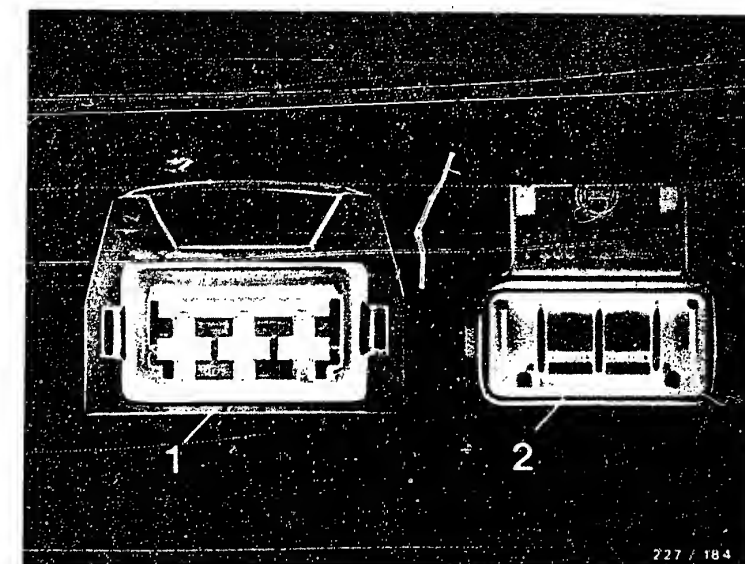
yes

Continued on F 7/F 8



1 = Male ignition distributor
connector

2 = Female ignition distributor
connector



F5

Trouble-shooting program

Volvo



F6

Trouble-shooting program

Volvo



yes

Check ignition pulse generator. Switch off ignition.
Remove EZ-K control unit and disconnect plug. Push back handle cover of EZ-K control-unit plug after unscrewing fastening screws and removing sealing rubber. See top picture. Connect EZ-K control-unit plug. Connect oscilloscope in accordance with operating instructions with program switch in "special" position.
For example, MOT 201:
Red clamp to EZ-K control-unit plug term. 24 (measured signal). Black clamp to vehicle ground.
Start engine.
Oscilloscope must indicate rectangular pulse. See bottom diagram.

Rectangular pulse present?

yes

Continued on F 11/F 12

no

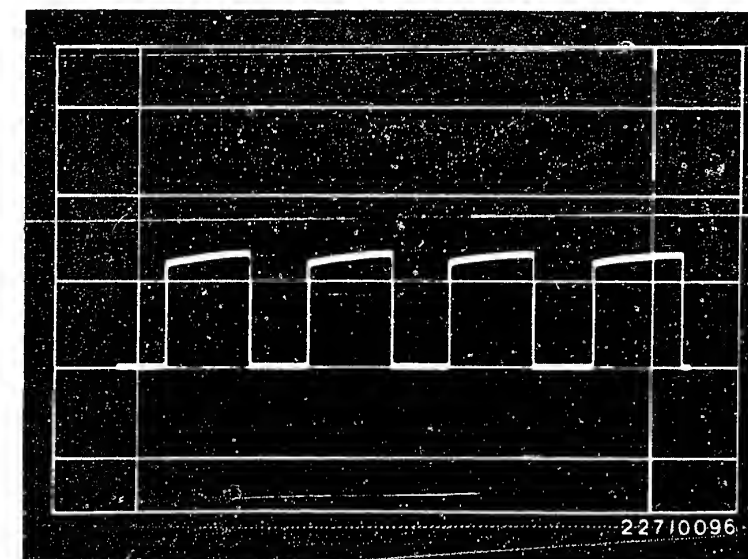
1. Connect voltmeter to EZ-K control-unit plug term. 4 (+) and term. 10 (-).
Switch on ignition.
Voltmeter must indicate > 10 V.
If < 10 V indicated, replace EZ-K control unit.

Continued on F 9/F 10



1 = Handle cover
Arrow = Fastening screws

Rectangular pulse



F7

Trouble-shooting program
Volvo



F8

Trouble-shooting program
Volvo



Continued

2. Switch off ignition.
Disconnect ignition-distributor plug and EZ-K control-unit plug.
Connect ohmmeter, one after the other, to:

| <u>Ignition-distributor plug</u> | | <u>EZ-K control-unit plug</u> |
|----------------------------------|-----|-------------------------------|
| Term. 4 | and | term. 4 |
| Term. 10 | and | term. 10 |
| Term. 24 | and | term. 24 |

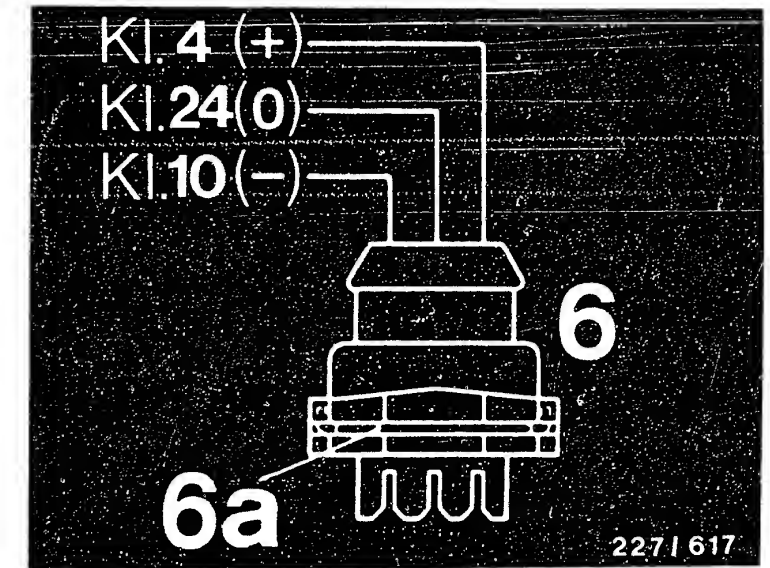
In each case, ohmmeter must indicate approx 0Ω (continuity).

Eliminate open circuit.

If there was no open circuit, replace ignition pulse generator/ignition distributor.

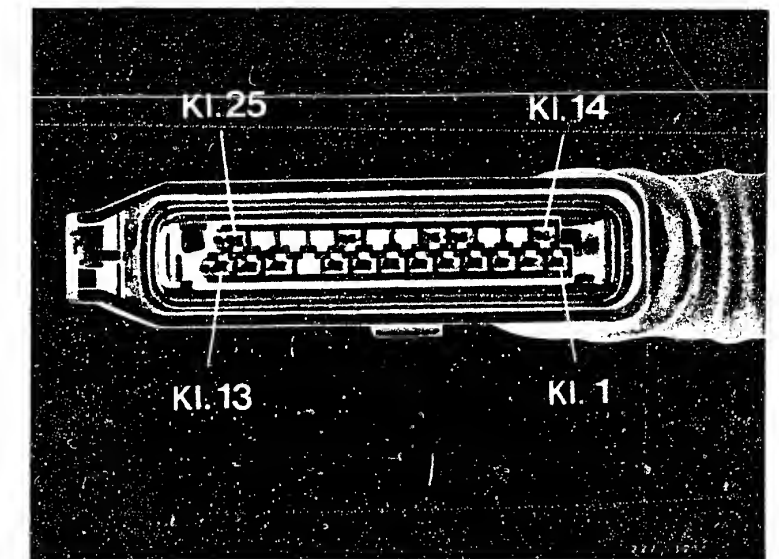
yes

Continued on F 11/F 12



6 = Ignition-distributor plug
6a = Wire retainer

EZ-K control-unit plug



F9

Trouble-shooting program
Volvo



F10

Trouble-shooting program
Volvo



yes

Check EZ-K control unit.

EZ-K control-unit plug and ignition-distributor plug connected.

Connect oscilloscope set to "special" range as per operating instructions.

For example MOT 201:

Red clamp to disconnected trigger-box plug term. 5 (measured signal).

Connect black lead to ground.

Start engine.

Oscilloscope must display square wave. See illustration.

Is square wave displayed?

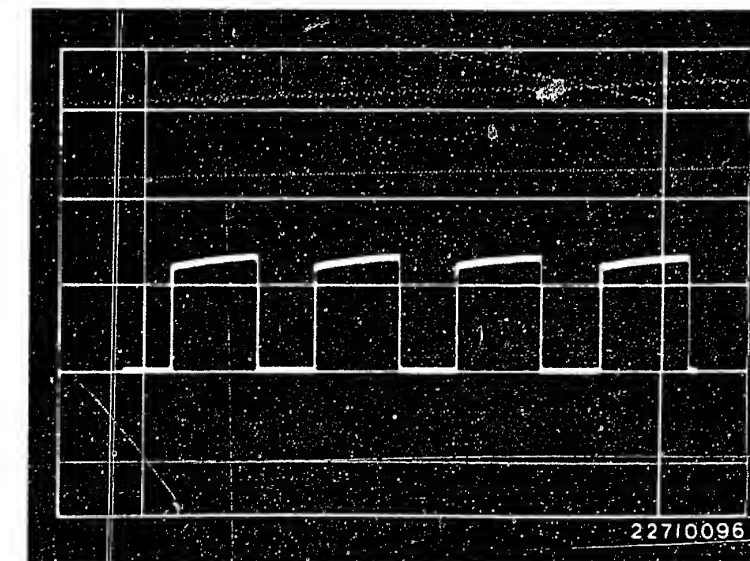
no

Disconnect trigger-box plug and EZ-K control-unit plug.

yes

Continued on F 15/F 16

Continued on F 13/F 14



Square wave

F11

Trouble-shooting program

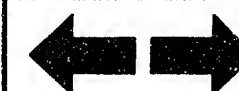
Volvo



F12

Trouble-shooting program

Volvo



Continued

Connect ohmmeter to the following one after the other:

Control unit
connector

EZ-K control-unit plug

term. 5

term. 16

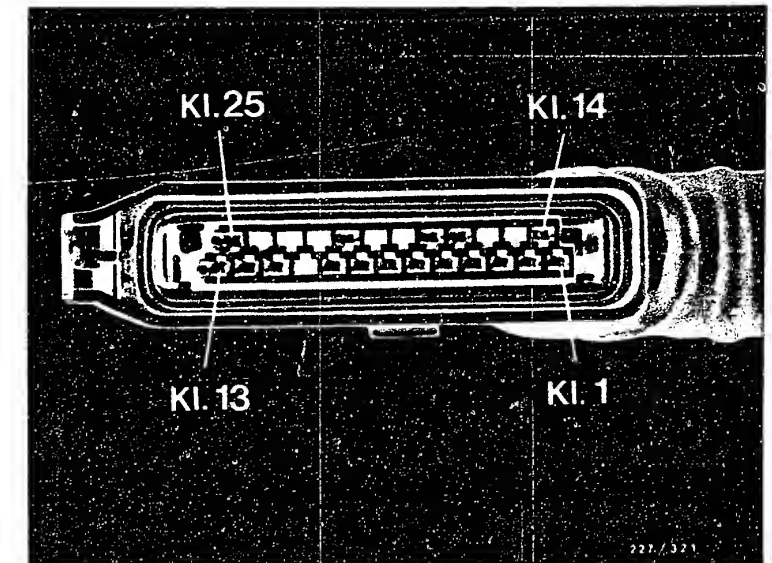
Ohmmeter must indicate approx. 0Ω
(continuity) in each case.

Eliminate discontinuity.

If there was no open circuit, replace EZ-K unit.

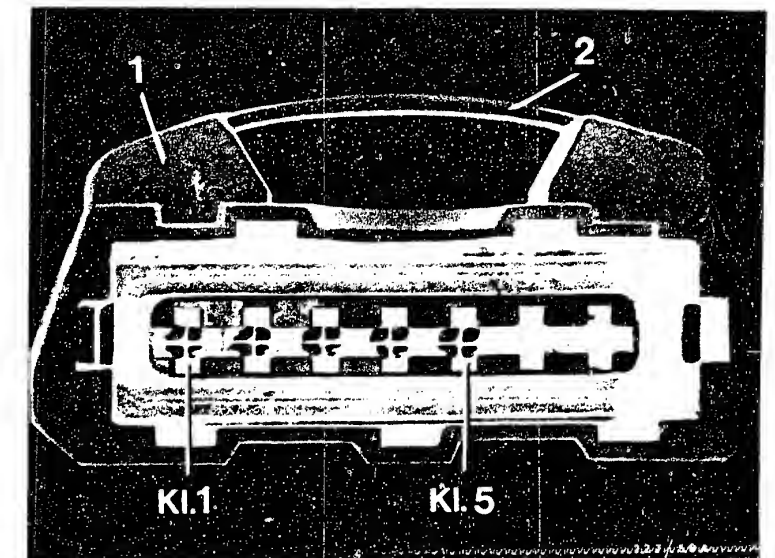
yes

Continued on F 15/F 16



EZ-K control-unit plug

1 = Trigger-box plug
2 = Wire retainer



F13

Trouble-shooting program
Volvo



F14

Trouble-shooting program
Volvo



↓ yes

Check ignition coil.

Visual examination:

Check whether plug (see picture) is present and whether sealing compound has escaped.

Electrical test:

Ignition coil, primary
(Term. 15 and term. 1) $0.6...1.0\Omega$ (take resistance of test lead and test prods into account).

Ignition coil, secondary
(Term. 1 and 4) $6.4...11.1\text{ k}\Omega$.

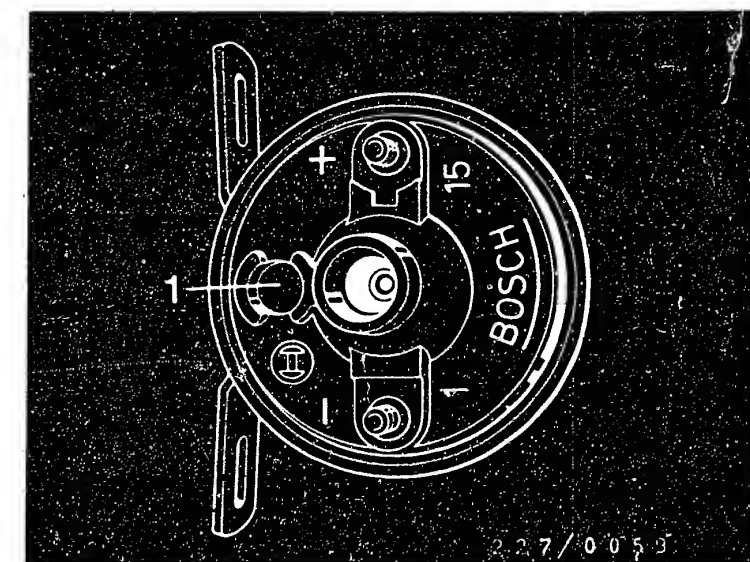
Plug present and/or no sealing compound escaped?

Resistance value correct?

no

1. If plug not present and/or sealing compound escaped, replace trigger box, EZ-K control unit and ignition coil.

2. If resistance values are not OK, replace ignition coil.



1 = Plug

yes

Replace control unit.

Test completed.

Tests at C 19 not necessary.

Note:

If customer complaint still exists, problem may be in fuel system or engine may have mechanical problem.

F15

Trouble-shooting program
Volvo



F16

Trouble-shooting program
Volvo



After-sales Service

Technical Bulletin

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22

Danger of Accident on Semi-conductor Ignition Systems

VDT-I-227/102 B

11.1976

Please be sure to pass this bulletin on to your employees for their attention.

The increased demands made on their ignition systems by modern engines, and the wish for freedom from maintenance, led some time ago to manufactures starting to equip their vehicles with semi-conductor ignition systems as original equipment. In most cases the performance of nearly all makes of such systems is higher than that of conventional systems, and further improvements are to be expected. This means that semi-conductor ignition systems have reached the point where contact with "live" parts or contacts (whether on the primary side or the secondary side) can prove fatal.

In this connection we should like to point out to you that the laws valid in your country regarding work on high-voltage systems must be adhered to when working on, or testing, semi-conductor ignition systems.

As a matter of principle, when working on such ignition systems the ignition is to be switched off. Included in such work are the following operations:

- Connection of engine testing equipment (timing light, dwell-tach tester, ignition oscilloscope etc.).
- Replacement of ignition system parts (spark plugs, ignition coil, ignition distributor, H.T. ignition cables etc.).

If it is necessary to switch on the ignition in order to test the system or make adjustments on the engine (to the carburetor for instance), then lethal voltages are present throughout the entire system.

This means that the danger of accident exists not only at individual components in the system (e.g. ignition distributor, ignition coil, trigger box, ignition harness), but also at the wiring harness (e.g. connection for the tachometer, diagnostic connector), on terminals, and on test equipment.

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N1

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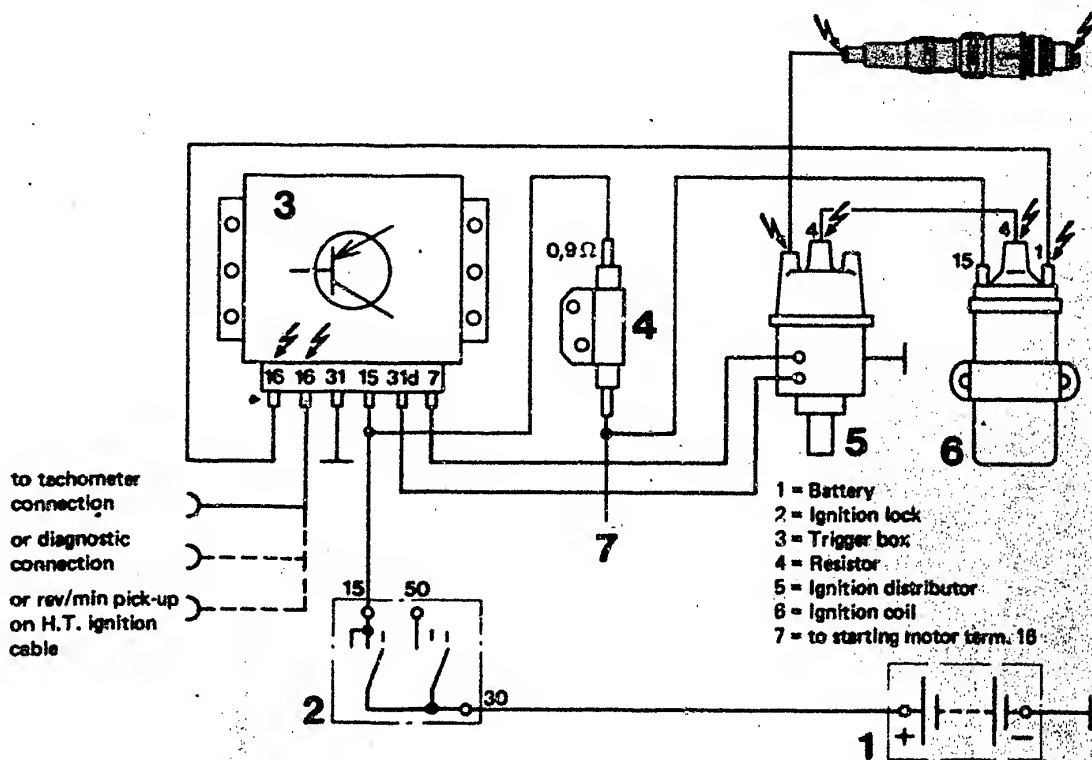


In addition, in the case of the capacitor-discharge ignition system (CDI), danger of accident is also present under the following circumstances:

- Operation of the trigger box without the ignition transformer.
- At the trigger box, (removed), relatively soon after it has been switched off (capacitor discharge).

Below is a typical terminal diagram of a semi-conductor ignition system, the danger points are marked with red high-voltage arrows. We would point out that all semi-conductor ignition systems, even the older ones, are to be regarded as dangerous in the sense as defined by this bulletin.

Please address any queries or comments concerning the contents of this publication to our representative in your country.



Terminal diagram

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EFFECTS OF ELECTRICAL AND ELECTRONIC
SYSTEMS ON HEART PACEMAKERS

VDT-I-227/107 En

1.1981

e.g. ignition systems, Jetronic, Motronic, ABS

Please ensure without fail that this Bulletin is passed on to your employees for their attention!

We have often been asked by some of our customers whether or not patients with heart pacemakers are endangered in any way by ignition systems. This theme was recently the subject of an examination carried out by the Ignition System Development Department of Robert Bosch GmbH in conjunction with Dr. Thull, lecturer at the Central Institute for Biomedical Technology at the University of Erlangen-Nürnberg and Biotronic GmbH & Co. of Berlin, a manufacturer of heart pacemakers. The magazine "Biomedizinischen Technik" (5/80) listed the results.

The most important discoveries in this practice can be summarized from the examination report as follows:-

1. Heart pacemakers corresponding to the latest state of the art are not affected by radiation (electromagnetic fields) from ignition systems.
2. With a stationary engine and the ignition switched off the heart pacemaker is not affected by any part of the ignition system, even when unintentionally touched. Maintenance work in the engine compartment, for example, can then be carried out without any danger.
3. With the engine running or stationary with the ignition switched on, touching current-carrying parts of the ignition system, as well as parts of any other electrical system, presents a certain danger for everybody. The heart pacemaker can here be affected under certain conditions (voltage, current and frequency).
Patients with heart pacemakers should therefore at all costs avoid touching current-carrying parts of electrical systems.
4. Furthermore, patients with heart pacemakers are more inclined to psychic shock effects than other people, even when they receive just a harmless electric shock, because many such patients are conscious of the increased danger to the cardiac activity.

We therefore consider it inadvisable for patients with heart pacemakers to be employed in workshops or on vehicles where ignition systems are being tested or repaired. If any members of your staff have heart pacemakers please carry out the necessary measures.

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We would like to add that heart pacemakers are not expected to be affected in any way by interference from other electronic products and systems which we manufacture, such as the Antiskid System (ABS), Jetronic, Motronic, because the much greater radiation intensity of the ignition systems examined in normal use has not caused any interference to heart pacemakers corresponding to the latest state of the art.

If you should receive questions on this matter from customers, please inform them accordingly.

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Technical Bulletin

13-39

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KNOCK SENSOR

VDT-I-227/110 En

0 261 231 ...

3.1983

Procedures for after-sales service

Description

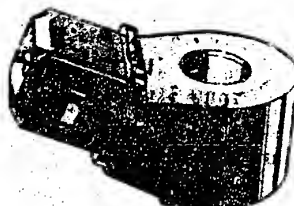
The knock sensor contains an active piezoceramic element. It is screwed to a chosen position on the engine block and sends a structure-borne signal which is processed further by an electronic control unit.

User

Saab is the first vehicle manufacturer to use the knock sensor which is being fitted to various turbo vehicles.

Components

Knock sensor 0 261 231 ... *



* The exact part numbers are given on the appropriate vehicle-equipment microcards AA...

Service/exchange parts

The knock sensor is a service part and is supplied by Bosch. The remaining components of the knock control are products made by other firms.

Technical documentation

Technical bulletin "New product" VDT-I-227/10 En.

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Training

Special training is not necessary.

Retrofitting

The knock sensor is not intended for retrofitting.

Warranty procedure

Components on which a claim is being made should be sent for inspection during the warranty period to our representative in your country. He should forward it to:

ROBERT BOSCH GMBH
KH/LAV - Auspackraum
zur Weiterleitung an K1/VAK2
7000 Stuttgart 30
Federal Republic of Germany

This regulation applies until further notice.



After-sales Service

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BREAKERLESS TRANSISTORIZED IGNITION SYSTEM

22

Warranty note

VDT-I-227/103 En
3.1979

Hybrid construction trigger boxes
0 227 100 100 for ignition distributor
with Hall generator (TCI-h)
0 227 100 102 for ignition distributor
with induction-type
pulse generator (TCI-i)

Apart from the well-known TCI-trigger boxes 0 227 100 0.., trigger boxes of hybrid construction have been fitted as standard since 9.78 (Fig. 1).

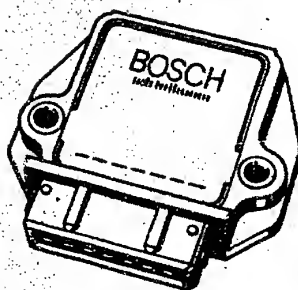


Fig. 1

Warranty procedure

If the complaints are justified, all these hybrid trigger boxes are to be sent, along with completed warranty documents, to your authorized representative for forwarding to the following address:

ROBERT BOSCH GMBH
KH/LAV - Auspackraum

zur Weiterleitung an K1/VAK 21
D-7000 Stuttgart 30

This instruction remains valid until further notice.

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NEW DESIGNATIONS FOR IGNITION SYSTEMS

VDT-I-227/108 En

1.1983

The introduction of new ignition systems has made it necessary to reclassify all designations.

The designations listed below will be used immediately in KH workshop and sales literature.

| Designation | Abbrev'd code | Meaning | Switching | Ignition control and spark advance | High-voltage distribution |
|--|----------------|----------------------------------|-----------------------------|------------------------------------|-----------------------------------|
| Coil ignition | SZ (CI) | ----- | Mechanical (breaker points) | Mechanical (ignition distributor) | Mechanical (ignition distributor) |
| Transistorized coil ignition | TSZ-K (TCI-c) | K=breaker-triggered | Electronic (trigger box) | Mechanical (ignition distributor) | Mechanical (ignition distributor) |
| Trigger box with conventional circuit techniques | TSZ-I* (TCI-i) | I=Induction-type pulse generator | Electronic (trigger box) | Mechanical (ignition distributor) | Mechanical (ignition distributor) |
| | TSZ-H | H=Hall generator | Electronic (trigger box) | Mechanical (ignition distributor) | Mechanical (ignition distributor) |
| Transistorized ignition | TZ-I* (TI-i) | I=Induction-type pulse generator | Electronic (trigger box) | Mechanical (ignition distributor) | Mechanical (ignition distributor) |
| (Trigger box in Hybrid technique) | TZ-H* (TI-h) | H=Hall generator | Electronic (trigger box) | Mechanical (ignition distributor) | Mechanical (ignition distributor) |

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| Designation | Abbrev'd code | Meaning | Switching | Ignition control and spark advance | High-voltage distribution |
|--|---------------|-----------------|--|------------------------------------|---|
| Breakerless semiconductor ignition with or without knock control | EZ EZ-K | K=Knock control | Electronic (trigger box or control unit) | Electronic (control unit) | Mechanical (ignition distributor or high-voltage distributor) |
| Distributorless ignition with or without knock control | VZ VZ-K | K=Knock control | Electronic (control unit) | Electronic (control unit) | Electronic (dual-spark ignition coil, or 1 ignition coil for each spark plug) |

*Note: The ignition system can also be equipped with a DLS unit (digital idle stabilization) or with an ELS unit (electronic idle stabilization) or with an ESV unit (electronic ignition retardation).



After-sales Service

Motor Vehicle Service Information

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INCORRECT DISPLAY OF ROTATIONAL SPEED AND
DWELL ANGLE ONLY WITH TRIGGER BOXES
0 227 100 ... (TCI-i, TCI-h) WITH CURRENT
LIMITATION

VDT-I-Gen. 030 En
6.80
Supersedes Ed. 3.80

For additional information see VDT-I-Gen. 032 En

1. General

In comparison with conventional ignition systems, transistorized ignition systems with current limitation have different primary voltage characteristics. During the dwell period the voltage at terminal 1 of the ignition coil may assume values from 1.5 V to battery voltage (or greater). This may lead to an incorrect display of rotational speed and dwell angle when testing the ignition system. However, there is no functional defect in the ignition system, and, for this reason, the trigger box must not be replaced. Incorrect displays may occur with the testers listed below:

| | | | | |
|-----|---------|-------------------------|-----|--------|
| MOT | 001.00} | Rotational-speed | KTE | 001.00 |
| | 001.01} | display O.K. with these | | 001.02 |
| | 001.02 | testers | | 001.03 |
| | 001.04 | | | |
| | 002.00 | | | |

By now, the following vehicles may be fitted with breakerless ignition systems with current limitation:

| | | | |
|--------------------|---------------------------------------|--|--------------------------------------|
| Audi | (Bosch/Fairchild- ignition system) | Mazda | (Mitsubishi ignition system) |
| BMW | (Bosch ignition system) | Mitsubishi | (Mitsubishi ignition system) |
| Citroen | (Delco ignition system) | Nissan-Datsun | (Hitachi ignition system) |
| Fiat | (Delco ignition system) | Peugeot | (Bosch ignition system) |
| Ford | (Delco ignition system) | VW | (Bosch/Fairchild ignition system) |
| General- Motors | (HEI-ignition system) | Bosch transistorized ignition system for retrofitting 0 227 100 920 | |

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Motor Vehicle Service Information

Volvo



2. Test instructions

2.1 Rotational speed

Incorrect rotational-speed display can be recognized as follows:

If one starts at the idle speed and slowly increases the engine speed, then the incorrect display can be recognized by an abrupt reduction in the rotational-speed display (e.g. from 2400 min⁻¹ to 1200 min⁻¹).

It is, however, possible to attain correct rot.-speed measurements as follows:

Connect a ballast resistor of 0.9 or 1.0 Ohm (see Fig.) in series in the line to term. 15 of the ignition coil (take care not to cause a short circuit). After the rotational-speed measurement, the ballast resistor must be removed (otherwise starting difficulties and misfiring). Connect tester as per operating instructions.

Suggestion for user manufacture

Required parts:

1 ballast resistor 0.9 Ohm

or

1 ballast resistor 1.0 Ohm

2 blade receptacles e.g.

approx. 0.2 m cable, 1.5 mm² e.g.

2 insulated clips

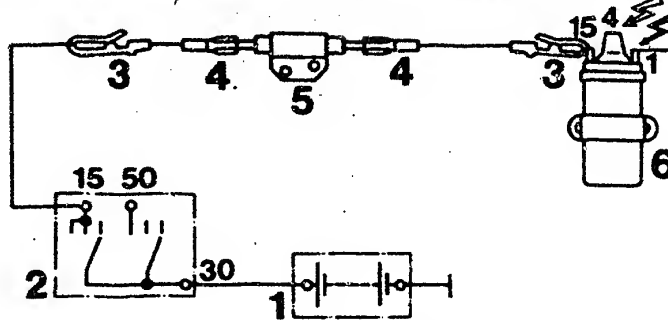
Part No. 0 227 900 002

Part No. 0 227 900 101

Part No. 1 901 355 881

Part No. 6 210 150 150

Commercially available



1 = Battery

2 = Ignition switch

3 = Clips

4 = Blade receptacle

5 = Ballast resistor

6 = Ignition coil

⚡ approx. 400 V

⚡ approx. 25 kV

2.2 Dwell angle

The dwell angle is electronically controlled. A measurement of the dwell angle is no longer performed.

2.3 Ignition point

Is displayed correctly. Connect tester as per operating instructions.



After-sales Service

Motor Vehicle Service Information

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MOTORTESTER CONVERSION

Incorrect display of rotational speed,
dwell angle and ignition point
only with trigger boxes
0 227 100 ... (TCI-i, TCI-h) with current
limitation

VDT-I-Gen. 032 En
6.80

For additional information see VDT-I-Gen. 030 of 6.80

Re.: Motortester EFAW 268
268 S 10
269
214 B
AE 2000

1. General

Please make sure that the above-mentioned motortesters in your workshop and at your customers (e.g. motor vehicle workshops, oil companies, gas stations, vocational schools etc.) are converted. The conversion is subject to payment and is carried out by the K7 after-sales service of the responsible BG. The standard time is 15 work units (with fitting of switch).

2. Why motortester conversion?

In comparison with conventional ignition systems, transistorized ignition systems with current limitation have different primary voltage characteristics. During the dwell period the voltage at terminal 1 of the ignition coil may assume values from 1.5 V to battery voltage (or greater). This may lead to an incorrect display of rotational speed and dwell angle as well as to incorrect triggering of the meter when testing the ignition system. There is, however, no functional defect in the ignition system, and, for this reason, the trigger box must not be replaced. Since, with the above-listed motortesters, the timing light is triggered by the signal path dwell angle - meter, this incorrect triggering also leads to incorrect flashing and thus to an incorrect display of the advance angle.

3. Conversion measures

The situation is to be remedied by modifying the wiring of the testers so that the timing light is triggered by the clamp-on induction pickup and the pulse shaper stage.

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N12

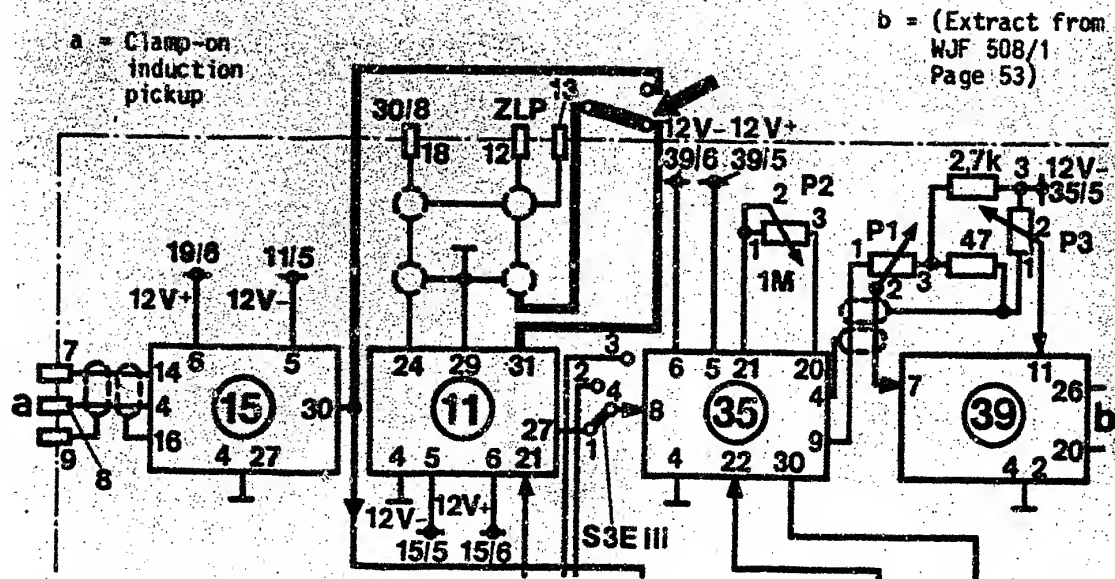
Motor Vehicle Service Information

Volvo



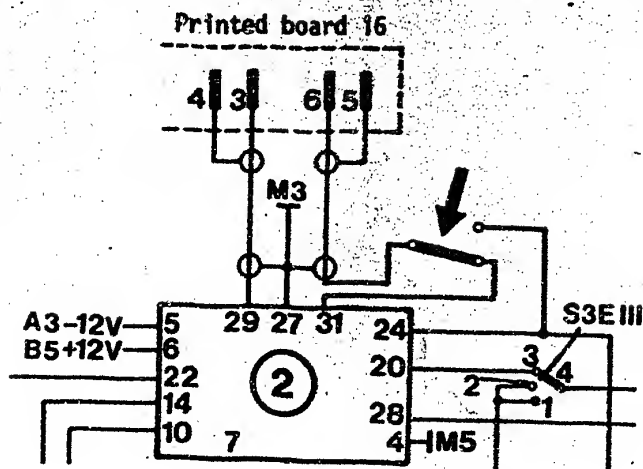
Remove the line of the ZLP* from pin 31 of printed board 11 (coupling stage) and connect to pin 30 of printed board 15 (pulse shaper stage) via a switch with change-over contact (e.g. 0 341 500 803). In addition, a new line must be connected from pin 31 of printed board 11 to the other contact of the switch with change-over contact. Arrow points to switch with change-over contact.

* ZLP = timing light



EFAW 214 B

Remove the line from terminal 6 of printed board 16 to pin 31 of printed board 2 (coupling stage) and connect to pin 24 of the same printed board via a switch with change-over contact (e.g. 0 341 500 803). In addition, a new line must be connected from pin 31 of printed board 2 to the other contact of the switch with change-over contact. Arrow points to switch with change-over contact.



By fitting the switch with change-over contact in the front panel of the motor-tester, it is possible to switch over from standard ignition systems to those with current limitation. We recommend that the switch positions be marked correspondingly: e.g. "standard" - "current limitation". These conversion measures have already been published in the K7 information sheet KJF 28/7911.

4. Test instructions

4.1 Standard ignition systems

Switch position: "standard"

All other tester connections as per operating instructions.

4.2 Ignition systems with current limitation

Switch position: "current limitation"

In order to trigger the timing light, the induction-type pulse generator (clamp-on pickup or red pickup) must always be connected during the measurement.

The selector switch for ignition systems built into the motortester must be switched to standard coil ignition (not to TCI) with these ignition systems.

All other tester connections as per operating instructions.

The dwell angle is electronically controlled. A measurement of the dwell angle is no longer performed.



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TESTS ON ELECTRONIC IGNITION SYSTEMS
(TCI, TZ)
TESTER INSTRUCTIONS

VDT-I-Gen. 035 En
3.1981

The following tests are listed in order and current Tester operating instructions or in Trouble-shooting with the oscillograph.

- "Separate ignition coil test" (concerns EFAW 213, 214, 268, AE 2000).
- Calculating the "ignition voltage reserve" (concerns EFAW 213, 214, 268, AE 2000 and MOT series).
- "Intensified insulation test" (concerns EFAW 213, 214, 268, AE 2000 and MOT series).

Nowadays transistorized ignition systems deliver more than 30,000 V secondary voltage.

To avoid damage to ignition coil, ignition cable and ignition distributor by voltage flashovers, the tests listed above should not be carried out on transistorized ignition systems.

The contents of this Service Information has already been published in the K7-Information K7-VJF 17/8012.

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Motor Vehicle Service Information

Volvo



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